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AUTHOR Palij, Michael
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ABSTRACT

A study investigated the issue of language background variability in the college students making up a psychology subject pool. A questionnaire survey of students at New York University revealed that 39 languages were represented and only 10% of the students indicated they were English monolinguals. Comparisons were made among students by subdividing them on the basis of (a) monolingual background, (b) age of acquisition of English, and (c) dominant language (English or another language). These groupings were then used to evaluate differences on Scholastic Aptitude Test measures, ratings of language ability, and ratings of reading patterns. Analyses indicate that bilingualism is a less important factor in differentiating subjects on language background than the age at which English is acquired, with the later acquisition of English having the greatest impact. Implications of these findings for subject selection for experiments in memory and cognition are discussed. Twenty-five tables and seven figures are included, and the study instrument is appended. (Author/MSE)

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WPP 87-1: ***Assessing Language Background Differences***

Michael Palij

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Department of Psychology
New York University

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Assessing Language Background Differences

Michael Palij
New York University

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Correspondence regarding this manuscript should be sent to:

Michael Palij
Department of Psychology
New York University
6 Washington Place, 8th Floor
New York, New York 10003

Assessing Language Background Differences

Michael Palij

New York University

How variable is the language background of students who make up a psychology subject pool? A questionnaire survey of students at New York University revealed that 39 languages were represented in the subject pool and that only 10% of the students indicated that they were English monolinguals. Comparisons were made among students by subdividing them on the basis of (a) bilingualism background, (b) age of acquisition of English, and (c) whether they ranked English as their best known language. These groupings were then used to evaluate differences on SAT measures, ratings of language ability, and ratings of reading patterns. The analyses indicate that bilingualism is a less important factor than the age at which English is acquired, with the later acquisition of English having the greatest impact. Implications of these results for subject selection for experiments in memory and cognition are discussed.

One of the goals of psycholinguistic research is to identify the factors that affect the cognitive processing of language. Most often this has been translated into a concern about properties of stimuli or experimental manipulations such as instructions to the subject. However, the subjects themselves can be identified as a significant source of systematic variation and some researchers have recently started to study these *subject relevant* variables in their own right (by subject relevant variables we mean those characteristics of a subject that can have systematic relationships to the dependent measures used in an experiment). The purpose of this report is to identify several language background factors that may be important in the conduct of experiments on language processing, present an instrument that will allow their rapid assessment, and present the results of the use of this instrument with a psychology pool. It will be shown

that this instrument can help identify language background differences and that these differences are significantly related to measures of language and reading ability.

Subject Relevant Variables in Psycholinguistic Research

Subject relevant variables have traditionally been studied by researchers in *differential psychology*, that is, the psychology of individual differences, which has usually been associate with the field of psychometrics. Interest in these variables by mainstream cognitive psychologists has recently increased primarily as a result of new developments and expansions in research on intelligence. These include the cognitive components approach (e.g., Sternberg, 1982), which attempts to identify the processing components or stages necessary for performing an intellectual task, and the cognitive correlates approach (e.g., Hunt, 1983, Sholl & Egeth, 1982), which looks at the relationship of performance on standardized tests to performance on information processing tasks. What these two approaches have in common is an interest in identifying (a) the underlying cognitive processes that are involved in performing traditional tasks on intelligence tests and (b) why there is between-subject variability in performance.

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Correspondence regarding this manuscript should be directed to Michael Palij, Department of Psychology, New York University, 6 Washington Place, 8th Floor, New York, New York, 10003.

In a psycholinguistic context, this interest is most clearly seen in the research that has examined the nature of verbal ability (e.g., Goldberg, Schwartz, & Stewart, 1977, Hunt, 1983, Hunt, Lunneborg, & Lewis, 1975). For example, people who are "high verbal," as measured by standardized tests such as the verbal component of the Scholastic Aptitude Test (SAT), tend to access information in memory, especially semantic or conceptual information, more quickly than persons who are low in verbal ability. Also, other experimental results indicate that people who are high verbal tend to utilize verbal strategies in sentence verification tasks while people who are high spatial tend to utilize spatial strategies (Mathews, Hunt, & MacLeod, 1980). It would appear that language processing is importantly affected by those cognitive processes which we are in some sense "best" in.

There are, however, other subject relevant factors which are of interest for both theoretical and practical reasons. Although verbal ability has been shown to be an important variable in language processing it is easy to lose sight of the fact that verbal ability may be *language dependent*. If a person knows more than one language it is unlikely that the level of verbal ability in both languages will be equivalent (the bilingual who has equal ability in both languages is quite rare though most people informally define being bilingual as having equal abilities in both languages; Grosjean, 1982, p 230-240). For psycholinguists conducting research on English language processing this translates into a concern of whether verbal ability in English is affected by such factors as bilingual status, age of English acquisition, whether English is the person's "best" language, and so on.

That such a concern is warranted is borne out by some research in educational psychology where interest has focused on how to assess academic aptitude of foreign

students coming to the United States for college study. In this situation, testing of academic ability is usually done with English language tests (e.g., the SAT) but for most of the students taking these tests English is a second or a later language. If a student does badly on the standardized test is it because of lack of academic apititude or facility with the English language?

Alderman (1982) provides some insight into this situation by demonstrating that language proficiency is an important moderator variable in students' performance on standardized tests. Alderman examined the performance of native Spanish speaking Puerto Rican students who took the English language version of the SAT, a Spanish version of the SAT (the Pruebas de Aprovechamiento Academico, or PAA), and three different tests of English ability (the Test of English as a Foreign Language or TOEFL; Test of Standard Written English or TSWE; and English as a Second Language Achievement Test or ESLAT). Multiple regression analyses were conducted with SAT Verbal score regressed upon PAA-Verbal score (i.e., the measure of Spanish verbal ability), one of the English ability tests, and the product of PAA Verbal and English ability test (i.e., an interaction term for the two factors). The results showed that the interaction term, when involving either TOEFL or ESLAT, contributed significantly to the regression. An analysis of this interaction indicated that when English ability is low (as measured by TOEFL or ESLAT) there is practically no correlation between SAT Verbal and PAA verbal Scores. As English proficiency increases, the correlation between the two measures of verbal ability increases. A similar pattern was obtained for SAT and PAA quantitative scores.

Alderman interprets these patterns as demonstrating that the measurement of a general ability, such as verbal ability or mathematical ability, is moderated (to use his

term) by the proficiency the person has in the language in which the test is being given. A native Spanish speaking person may have high verbal ability when tested by the PAA but, if that person has a low level of proficiency in English, the SAT Verbal score may bear no relation to the PAA verbal score. It is only when proficiency is matched on both languages do the scores of the SAT relate systematically to the scores on the PAA. Although verbal ability may be independent of any specific language, the degree of verbal ability manifested in a language appears to depend upon the amount of experience and training in that language.

The implications of these results for psycholinguistic research are fairly clear: any task that make use of verbal ability in English will have to identify the subject's level of proficiency in and experience with English. Performance in experiments involving English language processing may very well be dependent upon whether English is a first or a second language or the age at which English was acquired. The question that now arises is why should the typical researcher be concerned with these issues?

Are Subject Pools Linguistically Homogeneous?

When enrollments in colleges consisted mostly of young, middle-class, white males it was reasonable to assume that most of these students had fairly homogeneous backgrounds in language acquisition and experience (i.e., mainly English monolingual). However, since the 1960s the college enrollment of foreign students and native Americans for whom English is a second language has been increasing. An examination of the enrollments of some colleges in the New York City area helps to highlight this point. New York University seems to be highly attractive to foreign students, with freshman coming from as many as 55 foreign countries (1980 estimate; American

Council of Education, 1983). At the City College of the City University of New York we find 40 different countries represented while down the street at Columbia University we find only 8 countries represented (American Council on Education, 1983). These numbers only reflect foreign student enrollments, however. Added to them should be the number of American born students who did not acquire English as a first language (the 1980 census estimates that about 7 million American children fall into this category. How many of these children go on to college in not known; Homel and Palij, 1987).

The extent to which researchers should be concerned with the issue of English language proficiency of potential subjects will depend upon (a) how many foreign students and native non-English speaking students there are at their institutions and (b) how representative the subject pool is of the student body. One could attempt to bypass this issue. This is most clearly seen with the "Native Speakers of English" criterion that is quite commonly used in experiments on memory, cognition, and language. Ignoring what this criterion means relative to the value of student participation in research as subjects (but see Palij, 1988), one question that researchers using this criterion should ask is how many subjects actually meet this criterion (we will also ignore here the issue of who and what a native speaker, an issue that turns out to be quite knotty; see Paikeday, 1986, Palij, in preparation). As it turns out, it is quite possible that "native speakers of English" may consitute only a simple majority of a subject pool.

This report will demonstrate that the language background of potential subjects can be extremely heterogeneous. A language background questionnaire was developed and used to survey the students in a psychology subject pool. This questionnaire obtained information on factors such as: which and how many languages were known, the age and context of acquisition for each language, asked for ratings of ability to use their two best

known languages, and asked for ratings of aspects of English reading ability. This background information was used to construct groupings of respondents according to the following factors: (a) bilingual status, (b) age of acquisition of English, and (c) person's ranking of English as either the best or second best language known. These groupings were then used to determine whether systematic differences can be detected for such variables as SAT verbal and total scores, reading patterns in English, and ratings of ability in the two languages best known by a person. Additional information on the variety of langauges known, contexts of acquisition, and relationships among these factors are presented.

Method

Materials.

A one page language background questionnaire was developed that could be filled out in about 5 to 10 minutes but which could still provide detailed information about the subject's language background. A copy of the questionnaire is provided in an appendix. The questions were generated with the following concerns in mind: (a) identify each language that a subject knew (up to 5 languages) along with a corresponding age of acquisition and context of acquisition and (b) the subject should rank order the two language he/she knew best and (c) provide ratings of ability to speak, read, write, and listen in these two languages. These questions will allow one to determine whether a subject is (a) monolingual or bilingual, (b) if bilingual, we can determine whether the subject acquired both languages simultaneously or successively and in similar or different contexts, and (c) if bilingual, we can identify whether ability in both languages is balanced or whether one is dominant. The information on bilingual status could be

used to identify subjects as compound or coordinate (Ervin and Osgood, 1954; Weintreich, 1953, pp 9-11), balanced or dominant (Weinreich, 1953, pp 79-80), or on the basis of any other distinction since key background factors have been identified.

Another factor that would be of direct interest to researchers and which "falls out" of the bilingual status factor is information on familiarity with and ability in English. Bilinguals may acquire English as either a first, second, or later language and the questionnaire allows one to identify its position in the learning sequence, its age of acquisition, whether it is ranked as being first or second best, and provides rating information on ability in English if it ranked first or second.

Additional questions requested general background information (e.g., sex, age) as well as information on performance on the SAT and ratings of English reading patterns.

Subjects and Procedures.

The language background questionnaire was included in a battery of test instruments that was administered to students taking Introductory Psychology in the spring of 1987 at New York University. Participation in the test battery was a routine feature of the course. Subjects were run in groups of about 50-60 and filled out the language background questionnaire along with other forms that were given to them in a numbered packet. About an hour was provided for completion of all of the forms.

Results

The results section is divided into 4 subsections:

1. General background characteristics of the subjects, including results for patterns of language acquisition and contexts of acquisition.

2. Grouping of subjects on the basis of bilingual background and analysis of differences among these groups on background measures, reading measures, and English and Non-English language abilities.

3. Grouping of subjects on the basis of age of acquisition of English and analysis of differences among these groups on background measures, reading measures, and English and Non-English language abilities.

4. Grouping of subjects on the basis of whether English was ranked as their best known language or second best known language and differences between these groups on background measures, reading measures, and English and Non-English language abilities.

I. General Background Characteristics.

Table 1 provides descriptive statistics for the overall sample on background, reading, and language ability measures. In general, the sample contains slightly more females than males, is about 19 years old, and knows a little more than two languages on average (with a range of one to six languages). There appears to be a monotonic relationship between the mean age of acquisition of second/later languages and the order of acquisition ($r(3)= .94$, $p< .02$; mean age of acquisition for a first language was set to zero). The monotonicity is emphasized because the function appears to be negatively accelerating, that is, the time intervals between the mean ages of acquisition for third and later languages are growing progressively shorter.

Insert Table 1 About Here

SAT Measures. SAT scores were requested and 80.59% of the respondents provided SAT verbal scores while 82.70% provided SAT total scores. Notice that the difference between the SAT verbal and total scores implies that the mean SAT quantitative score should be about 589.

Reading Measures. The respondents were requested to provide ratings of their reading speed and comprehension for recreational reading materials (e.g., magazines, novels) and for technical reading materials (e.g., textbooks, journal articles). Reading speed was rated on a five point scale where 1 meant that one read slower than one's N.Y.U. peers, 3 meant that one's speed was equal to one's N.Y.U. peers, and 5 meant that one read faster than one's N.Y.U. peers. Comprehension was measured on a similar scale. The overall mean of the ratings for this fourfold combination are within one standard deviation of the value of 3, thus indicating that overall the sample did not rate itself as being different from its N.Y.U. peers.

English Language Abilities. The respondents were requested to provide ratings of their ability to speak, read, write, and listen in English if English was either their best known or second best known language. Ratings were based on a five point scale where 1 meant that one had minimal ability, 3 meant average ability, and 5 meant advanced ability. As can be seen, the mean ratings for these abilities in English are toward the high end of the scale (i.e., greater than 4).

Other Non-English Language Abilities. The respondents were requested to provide ability ratings in any other language they knew as long as they ranked that language as being either the best known or second best known. Ratings were based on the same scale used for rating English language abilities. The mean ability ratings for the

non-English languages are lower than the comparable values for English abilities, mostly scattered about the average level of ability.

Ranking of English as a Best Known Language. Respondents were requested to rank order the two languages that they knew best in preparation to rating their abilities to use those two languages. Of the 235 respondents who provided a first place ranking 86.81% ranked English as being their best known language. Of the 209 respondents who provided a second place ranking 13.40% ranked English as their second best known language.

Order of Language Acquisition. Table 2 is a two-way frequency and percentage table for the 39 languages reported known by the respondents crossed with their order of acquisition as a first to fifth language. The rows are ordered according to the magnitude of frequency in column one (i.e., frequency of being acquired as a first language). English is ranked first because 149 or 63.40% of the sample reported acquiring English first. This means less than two-thirds of the sample have English as a "Native" language or, alternatively, 1 in 3 respondents acquired some language other than English first. Chinese is the second most frequently acquired first language and Spanish is third. Together, these three languages account for 80% of the first language sample. Note also that only 22 of the 39 languages listed (i.e., 56.41%) were identified as being first languages.

English is also the most frequently acquired second language. This is not surprising given that 36.60% of the sample did not acquire English as a first language. However,

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Insert Table 2 About Here

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only 81.39% of this group went on to acquire English as a second language; the remaining 18.61% acquired English as a third or fourth language. No one acquired English as a fifth language. Spanish is the second most frequently acquired second language, followed by French.

The number of people knowing three or more languages decreases as a function of the number of languages known (with only 7 people or 2.95% of the sample knowing five languages). A language other than English is the most frequently acquired third to fifth language (mainly Spanish and French).

The subject pool appears to contain a rather diverse set of languages and patterns of acquisition. Notice that a researcher who uses a "Native Speaker of English" criterion for allowing members of the pool to participate in an experiment has less than two-thirds of the pool to draw upon.

Contexts of Lanaguage Acquisition. Table 3 provides a two-way freqency breakdown of the context of language acquisition with the order of acquisition of first to fifth languages. All respondents indicated home or home and school as the context for the acquisition of the first language. There is a shift away from the home to school and other contexts for the acquisition of second and later languages. Fourth and fifth languages were never acquired at home.

Summary for General Background Measures. Less than two-thirds of the subject pool contains persons who are native speakers of English. Substantial numbers know two or more languages and the variety of languages known is very large. We will use

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Insert Table 3 About Here

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this information to group the subjects on the basis of bilingual background, on age of English acquisition, and whether English was ranked as being the first or second best known language. These groups will then be analyzed to determine whether significant differences exist among them on the variables of SAT scores, reading patterns, and rated language abilities.

II. Bilingualism Background and Grouping.

Information on the pattern of language acquisition was used to construct groups of bilinguals that would reflect differences in ability and familiarity with English and other languages. Two factors were used in constructing the groups: (a) whether English was acquired first, second, or third, and (b) the age of acquisition of the second language, which was trichotomized into the categories of less than age 6, between ages 6 and 12, and after age 12. Table 4 presents the groups that result from the combination of these two factors and the frequencies and percentages of respondents falling into each group. About 97% of the sample could be put into a category based on the foregoing factors; 7 subjects did not provide enough information to allow categorization (these respondents are represented by groups IX and X).

Several interesting features of the sample are revealed in Table 4. Although it was shown in Table 2 that 63.40% of the sample acquired English as a first language this is not the same as the percentage of English monolinguals in the sample. Only 10% of the sample could be identified as being English monolinguals, the rest are bi- or multilinguals. If a researcher equated being an English monolingual with being a native speaker of English there would be very few subjects to draw upon.

Insert Table 4 About Here

It should be noted that it is unlikely that the respondents who are identified as being monolingual are truly monolingual. There are two reasons for this: (a) assuming that the English monolinguals are U.S. citizens who were raised and schooled in the U.S., the typical curriculum in U.S. high schools usually include foreign language instruction, and (b) N.Y.U. has an entrance requirement of 2-3 years of foreign language instruction (College Entrance Examination Board, 1986). It is possible that some of the respondents never learned a foreign language in school and had this requirement waived when entering N.Y.U.; these respondents would be a small minority though. It is more likely that a number of these so-called monolinguals have had some systematic exposure to a foreign language but do not consider their level of ability sufficient to warrant calling it knowledge of a foreign language.

By the same token, it is not likely that all of the respondents identified as being bilingual are "truly" bilingual (in the informal sense). That is, all of these bilingual respondents probably have had some systematic exposure to two or more languages but their level of ability in the language (e.g., speaking, reading, etc.) will not be equal between languages and it is quite possible that these respondents only have minimal ability in their other language (e.g., perhaps only some vocabulary). However, current level of ability in a language is of less importance at this point than identifying systematic patterns of language exposure. That is, even though one does not have much current ability in a previously used language it may still be available or influential in cognition. This is clearly seen in certain instances of aphasia where long unused

languages suddenly reappear (e.g., Grosjean, 1982, pp 228-230; Paradis, 1977).

Returning to Table 4, a good portion of the sample (about 52%) acquired English as a first language and a Non-English language second within three time frames. If a researcher employing a native speaker of English criterion allowed participation by these subjects then about 62% of the subject pool now becomes available. But notice that the researcher who does so is implicitly saying that being bilingual has no cognitive consequences of interest, that the only important consideration is whether one was exposed to English from birth (see Arronson and Ferres, 1987, for an example of when this might be a problem).

The remaining groups of interest are two different types of bilinguals: (a) bilinguals who acquired English as a second language, and (b) bilinguals who acquire English as a third or later language. A researcher using a native speaker of English criterion probably would not use these subjects. These respondents constitute 38% of the sample.

Bilingual Group Differences. The first eight bilingual groups listed in Table 4 were used in a series of one-way analyses of variances (ANOVA) to determine whether the bilingual groups differed on SAT scores, reading measures, and language ability measures. The results for these measures are provided in the following subsections.

Bilingual Group Differences for SAT Scores. The top two rows of Table 5 provide descriptive statistics and ANOVA results for SAT verbal and Total scores. As can be seen from the ANOVA results, the groups differ significantly for both SAT verbal and total scores. The top two rows of Table 6 provide the results of post hoc Bonferroni t-

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Insert Table 5 About Here

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tests for idnetifying the differences among the groups. Figure 1 provides graphs of the values for SAT verbal and total scores and will assist in identifying differences among the groups.

The pattern of differences revealed by the post hoc tests for SAT verbal scores indicates that groups 1 to 5 (i.e., English monolinguals, Bilinguals who acquired English first, and Bilinguals who acquired some other language first and English before age 6) do not differ among themselves but do tend to differ from groups 6 to 8 (bilinguals who acquired English after age 6 or as a third language). In Figure 1 the bilinguals who acquired English first are represented by triangles connected by a dashed line; bilinguals who acquired English as a second language are represented by filled boxes connected by a solid line. English monolinguals are represented by a solitary triangle as the first value on the x-axis and those bilinguals who acquired English as a third language are represented by a lone filled box which is the last value on the x-axis. As can be seen, groups 1-5 cluster together at the high range of the SAT verbal score values. Those bilinguals who acquire English as a second language show a steady decrease in SAT verbal score as a function of age of English acquisition, that is, the later the acquisition of English the lower the SAT verbal score.

One interesting aspect of the pattern of SAT verbal scores is that being bilingual does not appear to be an important factor in affecting SAT verbal scores, rather, it

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Insert Table 6 About Here

Insert Figure 1 About Here

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appears that the age of English acquisition is the most influential factor. The bilinguals who acquired English first or as a second lnaguage before age 6 do not differ significantly from English monolinguals. This pattern of findings is readily interpretable. The later the acquisition of English the lower the levels of exposure and experience in English usage, that is, the level of English proficiency is lower. As Alderman (1982) has already shown, English language proficiency is an important mediating variable in performance on the verbal component of the SAT for subjects who have English as a second language.

The pattern of differences among the bilingual groups is less striking for SAT total scores but is also readily interpretable. Notice in the second panel of Figure 1 that groups 1-5 again hold the high range of values and that these values do not differ signficantly. But for bilinguals who acquired English as a second language we see a V-shaped pattern for the SAT total scores, that is, bilinguals who acquired English between ages 6 and 12 (group 6) have lower SAT total scores than the English monolinguals and bilinguals who acquired English first. However, bilinguals who acquired English after age 12 (group 7) do not differ significantly from groups 1-5. We have seen that group 7 has lower SAT verbal scores which implies that their SAT quantitative scores must be greater than their SAT verbal scores, quite likely higher than average (the difference between the mean SAT verbal score and mean SAT total for group 7 is 660). Obviously, to be allowed into N.Y.U., these respondents must have outstanding quantitative abilities which outweigh their limited English ability.

Bilingual Group Differences For Reading Speed Measures. The third and fourth rows of Table 5 provide descriptive statistics and ANOVA results for reading speed associated with recreational and technical materials. The bilingual groups differ significantly on both measures. The third and fourth rows of Table 6 provide the results

of post hoc testing with Bonferroni corrected t-tests. The top part of Figure 2 provides a graphic display of the mean reading speeds for each measure. The groups are identified as in Figure 1.

For recreational reading speed we again see a tendency for groups 1-5 to be similar and for these groups to be different from the bilingual groups which acquired English as a second language after age 6 or as a third language. These tendencies are apparent in the top two graphs of Figure 2. Groups 1-5 are flat while the line for bilinguals who acquired English as a second language slopes downward (this pattern is seen for both measures). As with the SAT verbal score, Group 7 (bilinguals who acquired English after age 12) rates itself the lowest in reading speed of recreational and technical material.

Bilingual Group Differences for Reading Comprehension. The fifth and sixth rows of Table 5 provide descriptive statistics and ANOVA results for rated comprehension of recreational and technical materials. The bilingual groups differ significantly on both measures. The fifth and sixth rows of Table 6 provide the results of post hoc testing with Bonferroni corrected t-tests. The bottom part of Figure 2 provides a graphic display of the mean comprehension for each measure.

Again, groups 1-5 tend to be similar in value and even group 6 is starting to join them (at least for technical reading comprehension). Group 7 (bilinguals who acquired English after age 12) rated inself lower in comprehension, though only most clearly with technical material.

Insert Figure 2 About Here

Bilingual Group Differences for Reading Time. The seventh and eighth rows of Table 5 provide descriptive statistics and ANOVA results for the number of hours spent per week in recreational and technical reading. Neither measure obtains an F value which is significant by conventional criteria (one F value is marginal, $p < .10$). Post hoc tests are provided for the recreational reading time in the seventh row of Table 6 but these are only marginal as well. These data are not graphically displayed.

Bilingual Group Differences for English Speaking Ability. The first row of Table 7 provides descriptive statistics and ANOVA results for differences among the bilingual groups for rated ability to speak English. The groups differ significantly on this ability and differences among the groups are examined with post hoc Bonferroni t-tests in the first row of Table 8. The means for this measure were graphed and are provided in the top left of Figure 3.

Again we find that groups 1-5 do not differ among themselves while tending to differ from the groups which acquired English later in life, especially group 7 (English acquired after age 12). The trend for bilinguals who acquired English as a second language is that ability to speak decreases with the delay in the age of English acquisition.

Insert Table 7 About Here

Insert Figure 3 About Here

Insert Table 8 About Here

Bilinguals Group Differences for English Reading Ability. The second row of Table 7 provides descriptive statistics and ANOVA results for differences among the bilingual groups for rated ability to read in English. The groups differ significantly and post hoc testing for these differences is provided in the second row of Table 8. The means for this measure were graphed and are provided in the bottom left of Figure 3.

As with speaking ability, groups 1-5 do not differ among themselves and tend to differ from those bilinguals who acquired English after age 6. Ability to read in English is rated lower as a function of the age of English acquisition.

Bilingual Group Differences For English Writing Ability. The third row of Table 7 provides descriptive statistics and ANOVA results for differences among the bilingual groups for rated ability to write in English. The groups differ significantly and post hoc testing for these differences is provided in the third row of Table 8. The means for this measure were graphed and are provided in the top right of Figure 3.

As with the previous two measures groups 1-5 do not differ among themselves while tending to differ from those bilinguals who acquired English age 6. Ability to write in English is rated lower as a function of the age of English Acquisition.

Bilingual Group Differences for English Listening Ability. The fourth row of Table 7 provides descriptive statistics and ANOVA results for differences among the bilingual groups for rated ability to listen in English. The groups differ significantly but not as greatly as with the previous English ability measures. Post hoc testing for this measure is provided in the fourth row of Table 8. The means for this measure were graphed and are provided in the bottom right of Figure 3.

Insert Figure 3 About Here

Although there was a significant overall F for differences among the groups the post hoc tests indicate only trendlike differences between means. This suggests that a complex contrast among the means may prove to be significant. However, the general pattern is for respondents who acquired English later in life to differ from English monolinguals and bilingual native speakers of English.

Bilingual Group Differences for Other Language Speaking Ability. Respondents were requested to provide ability ratings for both English and some other language, as long as the two were the best known languages. Obviously, English monolinguals could not provide ratings for another language and are excluded from the analyses provided in the following subsections. The first row of Table 9 provides descriptive statistics and ANOVA results for rated ability to speak in some other, non-English language. Groups differ significantly in their ability to speak in another langauge and these differences are examined with post hoc tests in the first row of Table 10. The means for this measure were graphed and are provided in the top left of Figure 4.

Insert Table 9 About Here

Insert Table 10 About Here

Insert Figure 4 About Here

The pattern of differences among the groups is more complicated for this measure than with the English speaking measure. Notice in the graph in Figure 4 that bilinguals who acquired English first and their other language before age 6 (group 2) rate themselves as having the same level of speaking ability as those bilinguals who acquired their other language first and English before age 6. From this common ground the groups begin to diverge in opposite directions. Considering those bilinguals who acquired English first, we see that ability to speak in the other language decreases as a function of the age that the langauge was acquired. The later the age of acquisition the lower the ability to speak in that language. This is similar to the pattern seen in Figure 3 for ability to speak English for those bilinguals who acquired English as a second language.

Considering those bilinguals who acquired English as a second language, we see that ability to speak in their other language *increases as a function of the age of English acquisition*. That is, the later that English is acquired the higher the rating for speaking ability in another language. It is not surprising that one has advanced ability in a non-English language when English is acquired late. However, it is surprising is that the earlier English is learned, the worse one is in one's native language. Apparently learning English at an early age has some sort of displacement effect on ability to speak in another language. The pattern of differences in the first row of able 10 substantiates the graphic patterns.

Bilingual Group Differences for Other Language Reading Ability. The second row of Table 9 provides the descriptive statistics and ANOVA results for rated ability to read in another language. The groups differ significantly on this measure and post hoc results for these differences are provided in the second row of Table 10. The means for this measure were graphed and are provided in the bottom left of Figure 4.

The pattern previously obtained with speaking ability in another language is replicated here but with one importance difference: there no longer is a common starting point. Whereas group 2 (English first, other language before age 6) and group 5 (other language first, English before age 6) did not differ on rated speaking ability in another langauge we see that for rated reading ability group 5 rates itself significantly lower that than group 2, in fact, lower than most of the other groups. It appears that acquiring English at an early age has a detrimental effect on reading ability in another language. Rated ability to read in another langugae increases the later that English is acquired.

Bilingual Group Differences for Other Language Writing Ability. The third row of Table 9 provides descriptive statistics and ANOVA results for rated ability to write in an other language. The groups differ significantly on this measure and post hoc testing results are provided in the third row of Table 10. The means were graphed and are provided in the top right of Figure 4.

The pattern of differences is similar to that obtained with other language reading ability: groups 2 and 5 differ, with the difference indicating that the early acquisition of English has a detrimental effect on other language writing ability. The later that English is acquired the higher the rated ability to write in an other language while for those bilinguals who acquired English first their rated ability to write in another language decreases as a function of the age of acquisition of the language.

Bilingual Group Differences for Other Language Listening Ability. The fourth row of Table 9 provides descriptive statistics and ANOVA results for rated ability to listen in another language. The groups differ significantly on this measure and post hoc testing results are provided in the fourth row of Table 10. The means were graphed and

are provided in the bottom right of Figure 4.

The pattern of differences obtained for listening ability in another language is similar to that obtained for speaking ability. Groups 2 and 5 do not differ but groups following them do. The later that English is acquired the higher the rated ability to listen in another language. For those bilinguals who acquired English first, the later the other language is acquired the lower the rated ability to listen.

Summary of Bilingual Group Differences. The most consistent pattern of findings is that the late acquisition of English has negative effects on such measures as SAT verbal scores, rated reading speed and comprehension, and rated ability to speak, read, write, and listen in English. This pattern is consistent with the notion that the later one acquires English the less experience and familiarity one will have with English (i.e., less English proficiency).

An unexpected pattern of findings is the relationship of the age of acquisition of English to performance in another language. It appears that the earlier a bilingual acquires English as a second language the lower the current ability in one's native language. Although this finding could be interpreted as reflecting some sort of cognitive limitation it probably more reasonable to view it as the effect of sociolinguistic factors on cognition (i.e., a *sociopsycholinguistic effect*). It is quite likely that the opportunities to acquire English as a second language also cause a reduction in opportunities to use one's native language. For example, assume that a child acquires some non-English language at birth in some other country and then is brought to the U.S. The child is faced with the following conditions: (a) the child is exposed to pressures to acquire and use English, and (b) the child finds that opportunities to use the native language dwindling and having

little relevance to English language activities. The pressure to learn English and abandon the other language is very great in the U.S. and can be overcome only if the community is supportive of the usage of the other language (Grosjean, 1982, pp 42-112).

Another issue that is raised by the pattern of results is whether bilingualism is an important cognitive factor. As we have seen, significant differences among the bilingual groups were obtained only when the age of English acquisition was considered. In general, the English monolinguals did not differ from the bilinguals unless English was acquired after age 6 or 12. For the measures used, then, bilingualism is not a relevant dimension and can be eliminated. In the next subsection respondents are regrouped on the basis of age of acquisition of English and we shall see that a much clearer picture of differences is obtained.

III. Age of English Acquisition Groupings.

The most consistent pattern of differences found with the bilingual grouping factor is that bilinguals who acquired English after age 6 differed from the English monolinguals and bilinguals who acquired English as a first language or as a second language before age 6. This suggests that for the measures used bilingualism is not a relevant dimension for identifying differences among respondents, rather, the age at which English was acquired is the more important factor. There are several ways to support this point.

If age of English acquisition is a significant factor then we should expect to see a significant correlation between it and the various measures that were obtained. Table 11 provides the correlations between age of English acquisition and the SAT and reading

measures. In calculating these correlations only the bilinguals who acquired English as a second or later language are used. Notice that six of the eight correlations are statistically significant and are negative in sign (i.e., the later the age of English acquisition the lower the value of the measure).

The largest correlation in the table is given by the SAT verbal score and age of English acquisition. The proportion of variance accounted for by this relationship is a respectible 35.52%. Figure 5 provides a scattergram of SAT verbal scores plotted against age of English acquisition. The regression relating the two variables indicates that there is about a 13 point drop in SAT verbal score for every year that the acquisition of English is delayed.

There is a significant negative correlation between SAT total score and age of English acquisition but this relationship accounts for less than 10% of the variance. Figure 6 provides the scattergram of these two variables. The regression of SAT total on age of English acquisition is also provided and we see that there is about a 7 point drop in SAT total score for every year that the acquisition of English is delayed.

The reading speed and comprehension measures are also significantly related to age of English acquisition, with correlations ranging from -.253 to -.321. The number of

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Insert Table 11 About Here

Insert Figure 5 About Here

Insert Figure 6 About Here

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hours spent per week reading recreational and technical material does not appear to be significantly related to age of English acquisition.

Correlations between age of English acquisition and rated abilities in English and another Non-English language were also calculated and are provided in Table 12. Considering the rated English abilities first, the correlations are negative, indicating that the later that English is acquired the lower the rated level of ability to speak, read, write, and listen in English. The size of these correlations are moderate and, in general, larger than those of reading speed and comprehension.

The correlations between age of English acquisition and abilities in the other, non-English language are positive in sign and are all statistically significant (range .42-.51).

The significant correlations suggest that it might be best to use age of English acqusition as a grouping factor. Table 13 provides a two-way frequency breakdown of the bilinguals groups with our new grouping based on age of English acquisition. The English monolinguals are maintained as a separate group in this new scheme. Those bilinguals who acquired English first are now combined and added to those bilinguals who acquired English as a second language before age 6. Note that those respondents who acquired English as a third or later language are redistributed among the three age of English acquisition groups.

Insert Table 12 About Here

Insert Table 13 About Here

The new grouping of subjects on the basis of age of English acquisition was used to reanalyse the SAT scores, reading measures, and language ability ratings. No truly new results were expected because the analyses based on the bilingual groups had already indicated that groups that acquired English later tended to differ from those groups that acquired English earlier in life. However, it was expected that this new grouping would make certain patterns in the data clearer.

Table 14 provides descirptive statistics and ANOVA results for the SAT scores and reading measures. Not surprisingly the F values are larger than those obtained with with the bilingual groups (it is not surprising because degrees of freedom have been reclaimed by consolidating groups that do not differ from each other). Post hoc comparisions with Bonferroni corrected t-tests are provided in Table 15. Two patterns emerge from these two tables: (a) English monolinguals do not differ from bilinguals who acquired English before age 6 and together tend to differ from bilinguals who acquire English late, and (b) for 5 of the 8 measures there is a downward trend across the groups; on the other 3 measures the bilinguals who acquired English after age 12 show an upward departure. On the latter finding, it is is easy to understand why those bilinguals who acquired English after age 12 would have high SAT total scores; the increase in time for recreational and technical reading may be due to their slowness in reading English or a compensatory process where they are reading more to develop their reading ability.

Insert Table 14 About Here

Insert Table 15 About Here

Table 16 provides descriptive statistics and ANOVA results for English language abilities with the age of English acquisition groups. As with the SAT and reading measures, the F values are larger than those obtained with the bilingual groups and the downward trend in rated ability is consistent across the measures. That is, rated ability in English decreases the later English is acquired. Post hoc Bonferroni t-tests (Table 17) again indicate that English monolinguals do not differ from bilinguals who acquired English before age 6 and these two groups tend to differ from the bilingual groups who acquired English later. Tables 18 and 19 provide similar information for rated ability to use another, non-English language. Here we see that ability to use another language increases the later that English is acquired.

The trends in the means in Tables 16 and 18 are most clearly seen when plotted against age of English acquisition; this is provided in Figure 7. In the left panel of Figure 7 we have the plotted means for English language ability and in the right panel we have the plotted means for ability in the otherr language. For English language ability, those subjects who acquired English after age 12 differ most strikingly from English

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Insert Table 16 About Here

Insert Table 17 About Here

Insert Table 18 About Here

Insert Table 19 About Here

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monolinguals and bilinguals who acquired English before age 6. For the other, non-English language abilities, we see a similar discrepency but in the opposite direction.

Summary of Age of English Acquisition Group Differences. The patterns of differences on the measures become clearer and easier to interpret when the respondents are grouped on the basis of age of English acquisition. The English monolinguals did not systematically differ from those bilinguals who acquired English from birth or before age 6, indicating that bilingualism is not an important factor for the measures obtained. A researcher empolying a native speaker of English criterion that allowed bilinguals who acquired English before age 6 would now have a pool of 192 potential subjects or 81% of the sample.

IV. Ranking of English Groupings.

Respondents were required to rank order the two languages which they new best and to provide ratings of their ability to use each. We have already seen the rating data used in the context of group differences based on bilingual background and age of English acquisition. In this subsection we will examine the differences between respondents who ranked English as their best known language and those who ranked English as their second best known language.

Best Known Languages. Table 20 provides a two-way frequency table of the languages that were ranked as being best or second best known broken down by their rank. Of the 39 languages that the respondents indicated that they had learned only 27 (69.23%) were ranked as being best or second best known. Of these 27 only 17 (62.96%) were ranked as being best known. Of these, English is ranked first most often (86.81%).

For the languages ranked second best known, 23 of the 27 (85.18%) were ranked second and of these Spanish was indicated as being the most common (34.45%).

We can examine how the respondents' ranking of English relates to their bilingualism background and to their age of acquistion of English. Table 21 provides a two-way frequency table of the bilingual grouping factor with the English ranking factor. Notice that there are three levels to the English ranking factor; two subjects did not rank English as either their best or second best known language. The trend that emerges in Table 21 appears to indicate that the earlier that English is acquired the greater the likelihood that it will be ranked as the best known language. Even so, a couple of bilinguals who acquired English before age 12 ranked English as their second best language and a number of bilinguals who acquired English after age 6 ranked English first.

Table 22 provides the frequency breakdown of age of English acquisition with ranking of English. The trends here are much the same as in Table 21 but are clearer. The earlier that English is acquired, the greater the number of people who rank English as their best known langugae; English tends to be ranked as the second best known language the later that it is acquired.

Insert Table 20 About Here

Insert Table 21 About Here

Insert Table 22 About Here

English Ranking Differences for SAT and Reading Measures. If English is ranked as being one's best known language we would then expect to see systematically greater levels of English language ability in the group which ranked English first. Table 23 provides descriptive statistics and t-test results for differences between the respondents who ranked English best and second best (because there are only two respondents in the group that ranked English as neither this group was not used in the contrasts).

Those ranking English as best known clearly had higher SAT verbal scores, by about 130 points, as well as higher SAT total scores, about 90 points higher. Similar differences were obtained for the reading speed measures and the recreational reading comprehension measure. The difference between groups for technical reading comprehension is only marginal at best. Neither of the reading time measures reached significance but it is interesting to note that the English ranked second group indicated that it read more hours per week.

English Ranking Differences for English Abilities. Table 24 provides descriptive statistics and t-test results for differences between the two groups on English language ability measures. Not surprisingly, those respondents who ranked English as their best known language also rated their abilities in English significantly higher than those respondents who ranked English as their second best language. The values of the rated abilities for those who ranked English best are in the advanced range of the scale (i.e., > 4.00) while those who ranked English as second best known rated it more toward the

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Insert Table 23 About Here

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average range (i.e., 3-4).

English Ranking Differences for Other Language Abilities. Table 25 provides descriptive statistics and t-test results for the English ranking groups for their rated ability to use another language. The pattern here is opposite to that shown in Table 24: those respondents who ranked English as their second best language tended to rate their ability in their other, non-English language higher than the comparable levels of those respondents who ranked English as their best known language. Those respondents who ranked English as their best language appear to rate their ability in their other language as being below average (i.e., < 3). Those respondents who ranked English as their second best language tended to rate their ability in their other language in the advanced range (i.e., > 4.00), with values comparable to those given for English by respondents who ranked English as their best language (compare with the first column of Table 24).

Summary of Differences for English Ranking. The pattern of differences obtained when respondents were grouped according to whether they ranked English as their best or second best known language was not different from the earlier results where age of English acquisition was used as at grouping factor. This was to be expected given the relationship between the two variables. Respondents who ranked English as their best language also had higher SAT scores, higher rated English reading speeds, and higher rated levels of ability in English. Respondents who ranked English second had lower

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Insert Table 24 About Here

Insert Table 25 About Here

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values on these masures but rated their abilities in their other language higher.

Discussion

Significant differences were obtained among groups when respondents were grouped on the basis of bilingual background, age of English acquisition, and ranking of English as a best known language. Differences among the bilinguals were obtained only between those bilinguals who acquired English early in life versus those who acquired it late. Also, English monolinguals did not differ from bilinguals who acquired English as a first language or before the age of 6. From these findings it seems reasonable to assert that the bilingual status of the individual does not serve as the basis for the differences; rather, the differences appear to be due to the age of acquisition of English. As we have seen, age of English acquistion is significantly correlated to rated abilities in both English and the other language a person knows, though these relationships are opposite in nature. With respect to the ranking differences, it also seems reasonable to assume that the differences are related to the age of acquisition of English. The greater the experience with English (i.e., the earlier the age of acquisition) the higher levels of ability one might have in English which, in turn, may serve as the basis for ranking English as a best known language.

The Meaning of the Absence of Bilingualism-Based Differences

One of the motivations for dividing respondents into groups on the basis of bilingual background is to determine whether being bilingual has any easily detectible cognitive consequnces. Historically, there has been some reason to believe so. Bilinguals

were once distinguished as being either compound or coordinate, where the key distinction was whether the two languages were acquired from birth (compound) or with the second language acquired later and in different contexts (coordinate; see Ervin and Osgood, 1954). As the cognitive revolution developed this compound-coordinate distinction was re-interpreted into a single-dual memory storage system: compound bilignuals were thought to have a single memory for both languages while coordinate bilinguals were thought to have dual memory systems, one for each language that was known (e.g., Kolers, 1968). However, demonstrating consistent differences in the cognitive processing of these two groups has always been problematic and has led some researchers to abandon the distinction. Part of the problem was that under certain conditions coordinate bilinguals would perform like compound bilinguals and vice versa (see Palij and Homel, 1987, for a discussion of these issues).

The results reported here could be used as evidence for maintaining the compound-coordinate, because of the differences between bilinguals who acquired English early and those who acquired English late. But to do so would be missing a more important point. For the current measures, age of acquisition appears as a strong effect while bilingualism is not present at all as an effect. It seems most reasonable to interpret this as a proficiency or experience effect, with age of English acquisition being a rough measure of English proficiency.

Focusing on age of language acquisition will allow us to see more clearly how this aspect of bilingual cognition relates to other standard phenomenon in monolingual cognitive research such as the word frequency/familiarity effect. It has been shown many times and in different ways that frequency of occurance of stimuli (e.g., words, pictures) has a significant effect on the processing of those stimuli, especially in recognition (e.g.,

Becker, 1976; Miller, 1979; McClelland and Johnston, 1977; Morton, 1969). As a concrete example, age of acquisition of words has been shown to be significantly related to the naming latency of pictures, with words acquired earlier in life producing faster latencies (Carroll & White, 1973; Lachman, Shaffer, & Hennrikus, 1974; however, it has been recently argued that age of word acquisition factor only affect processes involving semantic memory and not episodic memory, e.g., Coltheart & Winograd, 1986).

The suggestion being made here is that follow-up work examining the differences among respondents at a cognitive level would do well to focus on age of language acquisition as well as bilingual status. Bilingual status may become a more important variable when one is examining language specific processing. In this situation, the interaction of languages becomes important and the interaction may depend upon the languages that are known (e.g., Aaronson and Ferres, 1987; Bates and MacWhinney, 1981).

The English Displacement Effect in Foreign Language Ability.

An unexpected finding was the reduction in ability in another language as a function of the age of acquisition of English. It appears that the early acquisition of English displaces one's native language, probably by reducing the amount of time allowed for use of the other language. The reasons for why this occurs probably have more to do with the sociology of language usage and maintenance than with the psychology of language. As has been popularly documented by the television program "The Story of English" and its associated book (McCrum, Cran, & MacNeil, 1986) English has become the new *lingua franca*, perhaps the most commonly acquired second language in the world. English is rapidly becoming the preferred language language of science,

commerce, and diplomacy. These factors indicate that regardless of what one's native language is it is important to acquire English and to develop sufficient proficiency to use it effectively. Conditions that allow the early acquisition of English may also serve to reinforce its usage over that of other languages.

This raises questions of whether it is necessarily the case that one language must displace the other in cognitive ability. English may be a specical case because success in English may translate into success in business or science or some other important area. The support for the acquisition of English and incentive for maintaining a high level of motivation while acquiring it are quite clear; there are any number of concrete payoffs. But this may not be the case for other languages. Indeed, one may have to examine specific situations to determine whether there is a particular payoff matrix operating to support or eliminate a particular language. English is unique because it has global influence; few other languages have such sweep. And in the U.S. there is very little incentive for becoming or maintaining bilingualism. But other countries which view bilingualism as an established national policy, such as Canada (Homel and Palij, 1987), may be able to provide the necessary social support to maintain language ability at very high levels in two or more languages.

Implications for Research.

The data presented here have direct relevance to the conduct of research in cognitive psychology and psycholinguistics. It raises questions about the appropriateness of using the native speaker of English criterion in allowing subject participation in experiments since only 60-80% of the subject pool might be eligible under such a criterion (depending upon how exclusive an definition one uses for being a native

speaker). More importantly, the data raise questions about the appropriateness of ignoring the cognitive processes of people with mixed and diverse language backgrounds. We all would like to have subjects who are homogeneous with respect to background and ability but the results of the present study indicate that there may not be too many of these subjects around. We should acknowledge this reality and make plans to utilize subject background information in meaningful ways, either by examining how age of language acquisition may affect cognitive performance, as in the case of frequency effects in recognition memory and naming latency, or in the examination of language interactions in cognition, as shown by the work of Aaronson and Ferres (1987), Bates and MacWhinney (1981), and Bates, et al (1982).

In closing, the results of the present study have direct relevance to the conduct of research at New York University but this should not be interpreted as indicating that N.Y.U. is unique in this regard. Language background heterogeneity probably exists in all colleges and universities though to varying degrees. One can decide to ignore it or to use it productively in the furtherance of cognitive science.

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Figure Captions

Figure 1. Plot of mean SAT verbal score against bilingual group membership (left panel) and of mean SAT total score against bilingual group membership (right panel).

Figure 2. Plots against bilingual group membership for recreational reading speed (upper left), technical reading speed (upper right), recreational reading comprehension (lower left), and technical reading comprehension (lower right).

Figure 3. Plots against bilingual group membership for English speaking ability (upper left), English writing ability (upper right), English reading ability (lower left), and English listening ability (lower right).

Figure 4. Plots against bilingual group membership for Other language speaking ability (upper left), Other language writing ability (upper right), Other language reading ability (lower left), and Other language listening ability (lower right).

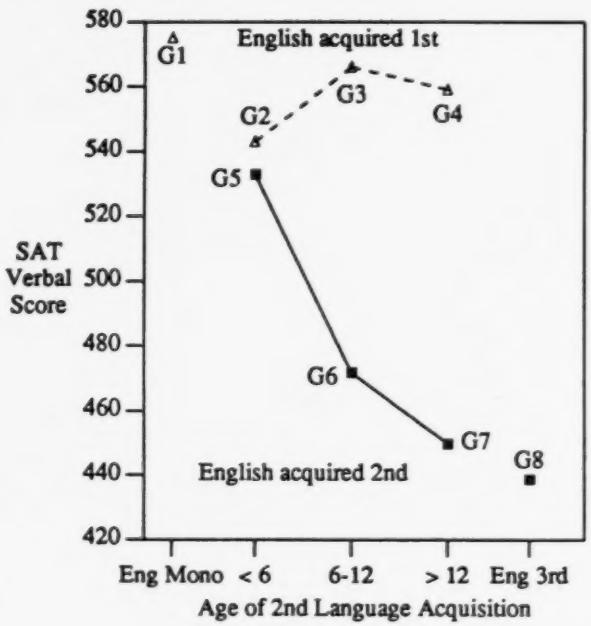
Figure 5. Plot of SAT verbal score against age of acquisition of English (note: only bilinguals who acquired English as a second language are used).

Figure 6. Plot of SAT total score against age of acquisition of English (note: only bilinguals who acquired English as a second language are used).

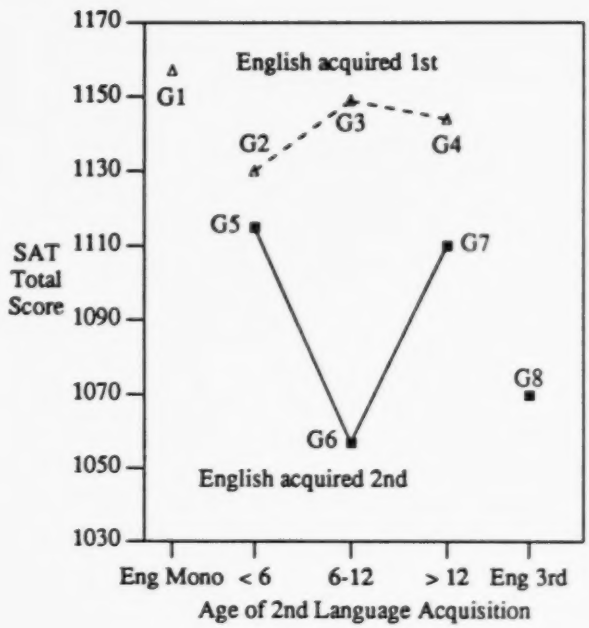
Figure 7. Plots against age of English acquistion for rated abilities to read, speak, write, and listen in English (left panel) and abilities to read, speak, write, and listen in another language (right panel).

SAT Score Graphs for Bilingual Groups

SAT Verbal Score

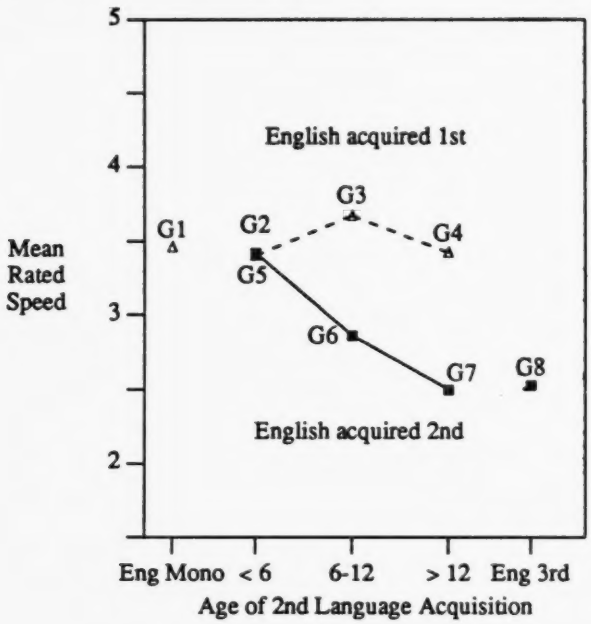


SAT Total Score

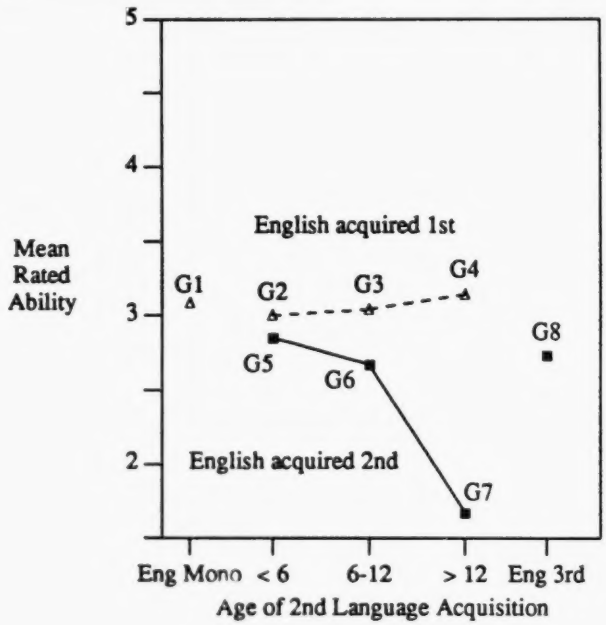


Reading Speed and Comprehension Ratings

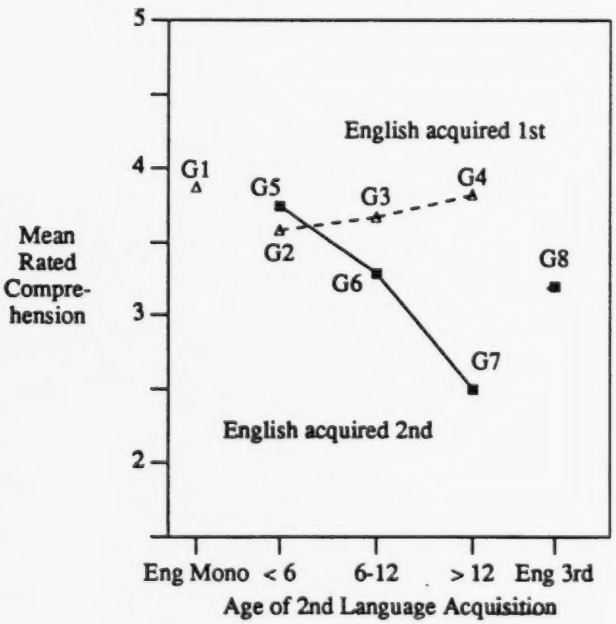
Recreational Reading Speed



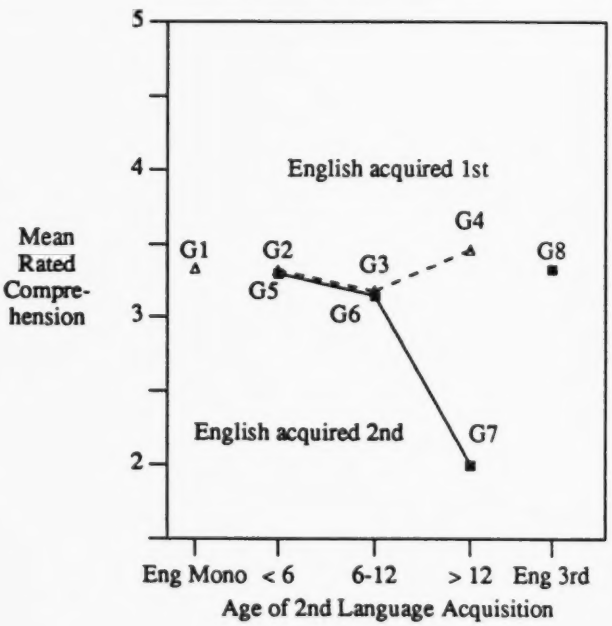
Technical Reading Speed



Recreational Reading Comprehension

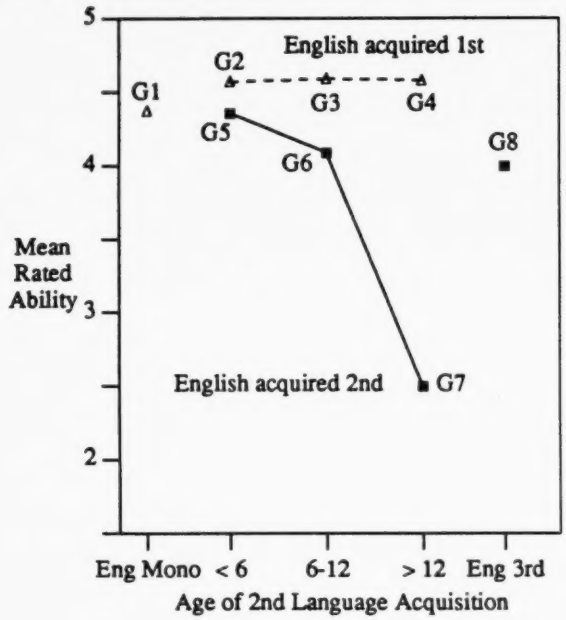


Technical Reading Comprehension

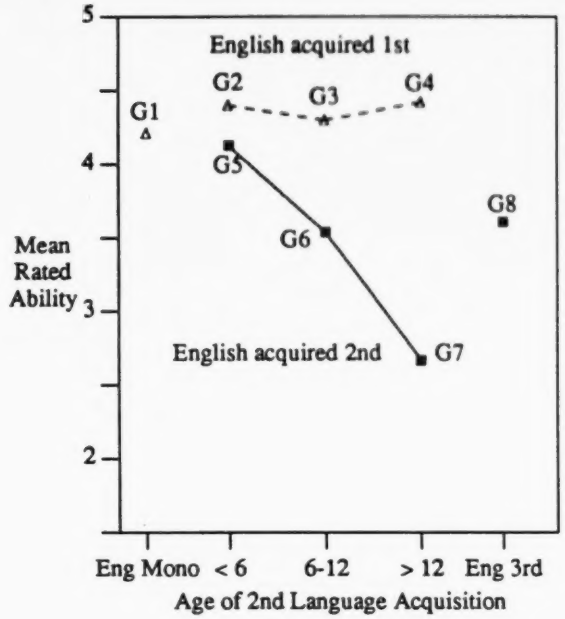


English Language Ability Ratings

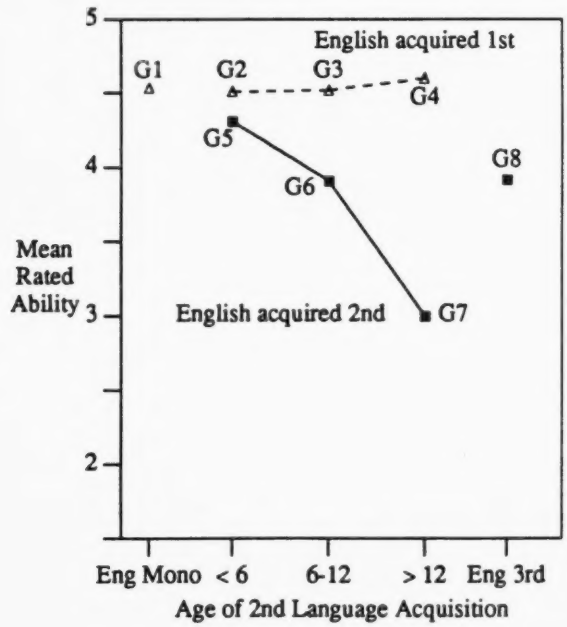
English Speaking Ability



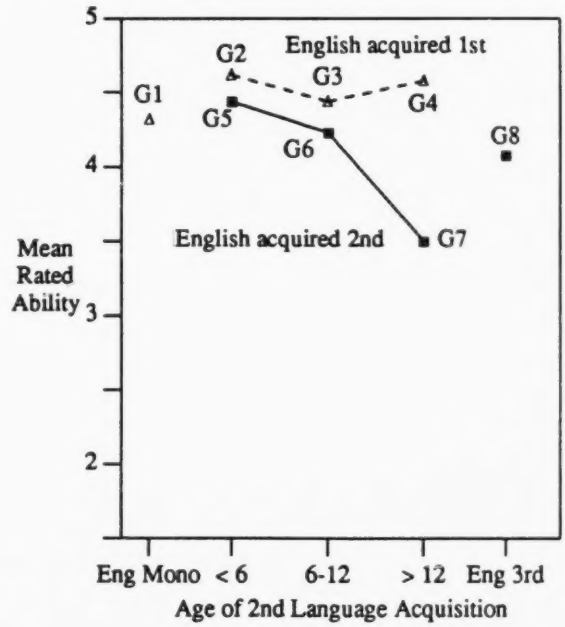
English Writing Ability



English Reading Ability

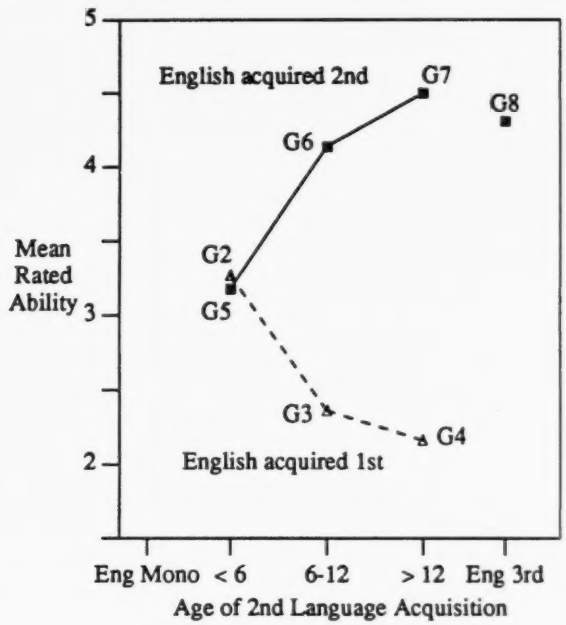


English Listening Ability

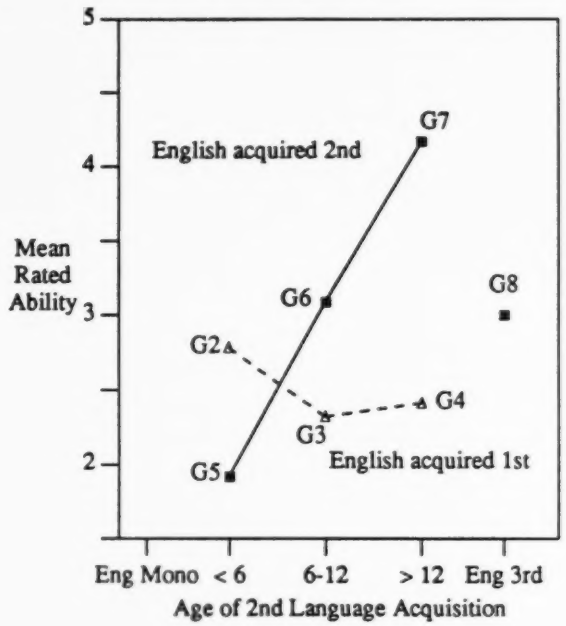


Other (Non-English) Language Ability Ratings

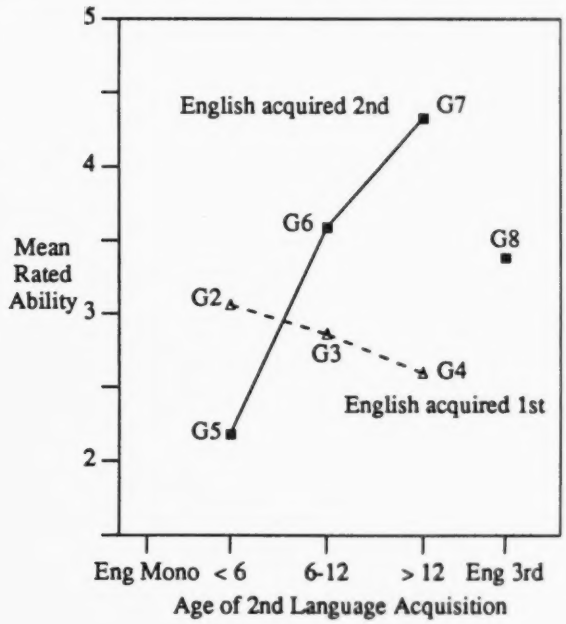
Other Language Speaking Ability



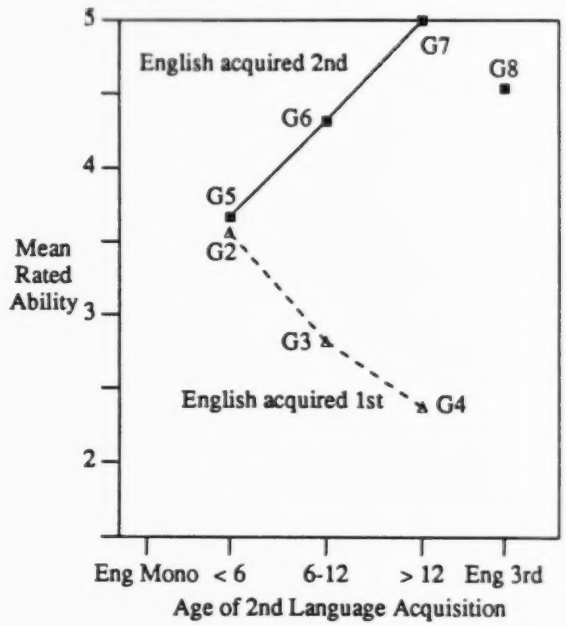
Other Language Writing Ability

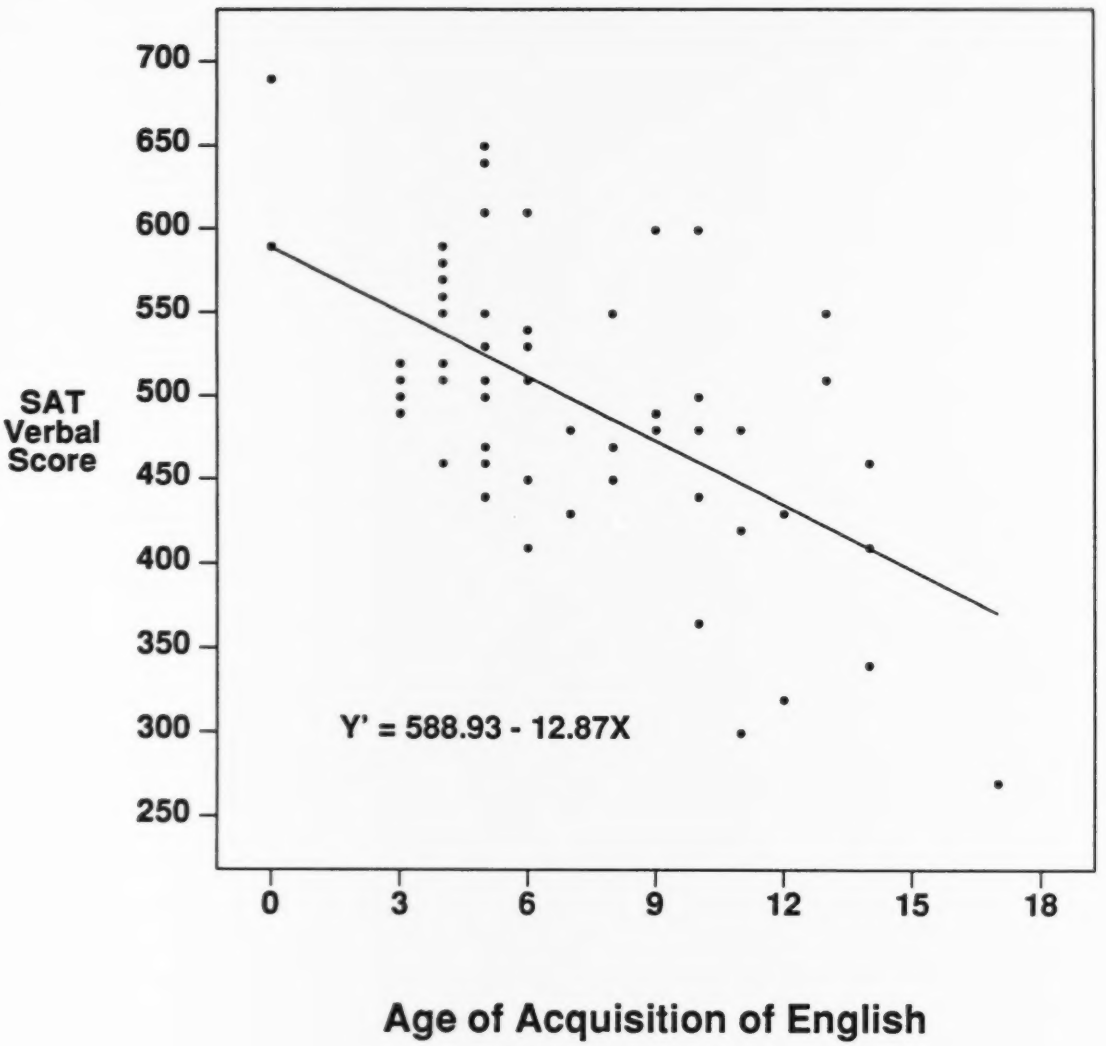


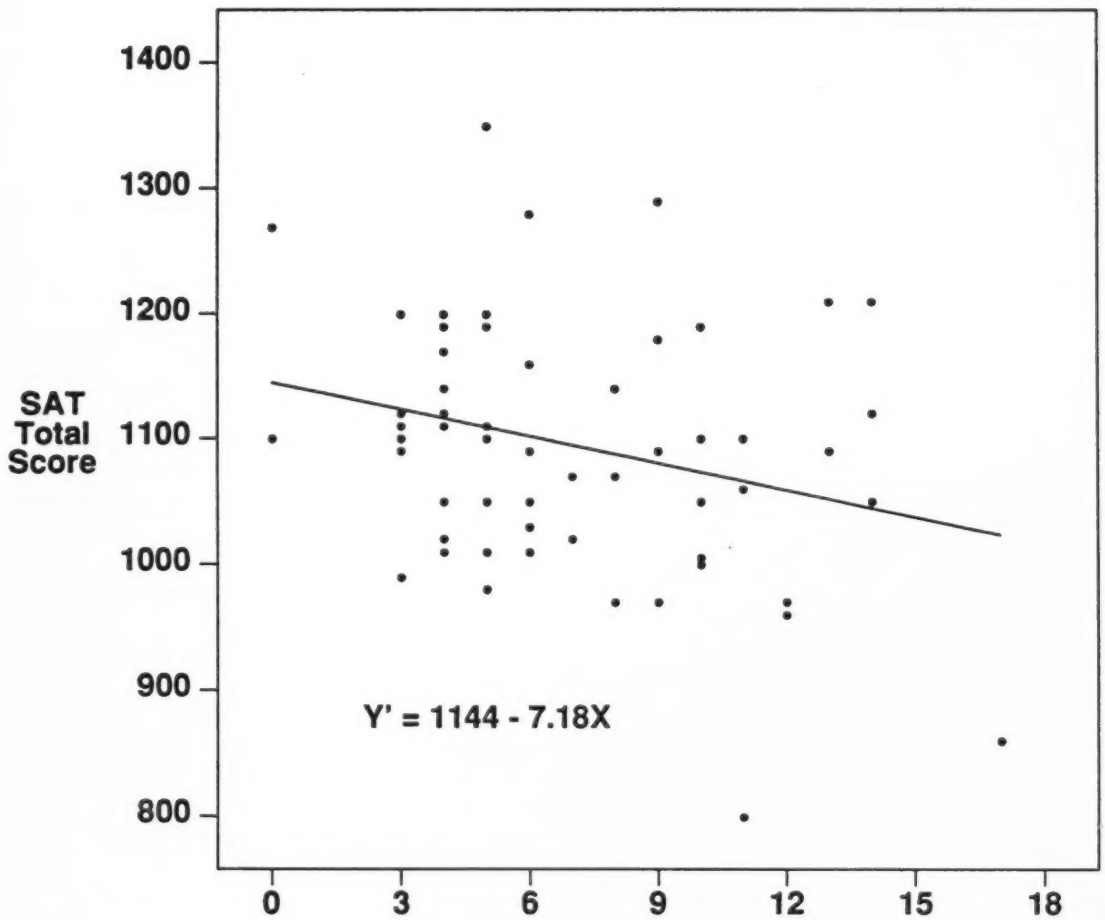
Other Language Reading Ability



Other Language Listening Ability

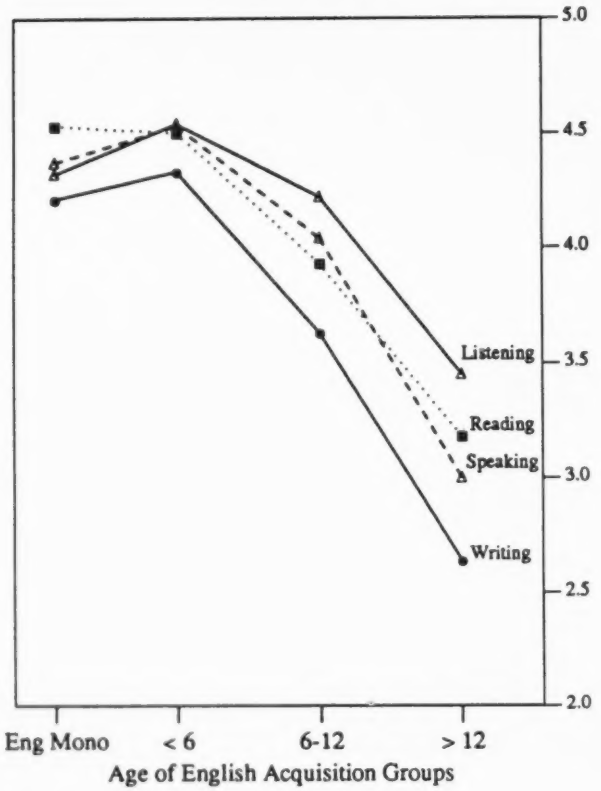



SAT Verbal Score
700
650
600
550
500
450
400
350
300
250
0
3
6
9
12
15
18
Y' = 588.93 - 12.87X
Age of Acquisition of English


1400
1300
1200
1100
1000
900
800
SAT Total Score
Y' = 1144 - 7.18X
0
3
6
9
12
15
18
Age of Acquisition of English

Language Ability Ratings for Age of English Acquisition Groups

Rated Abilities to Speak, Read, Write, and Listen in English



Rated Abilities to Speak, Read, Write, and Listen in Another Language

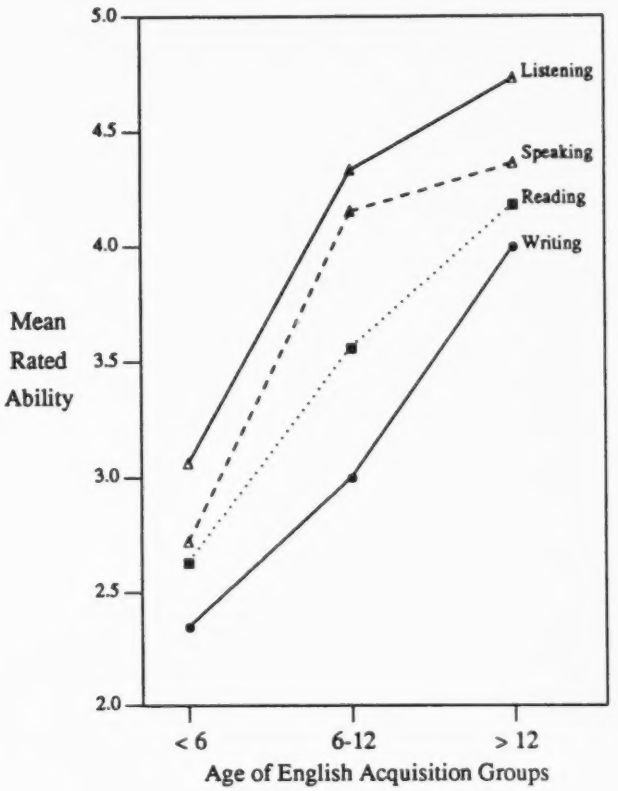


Table 1. Descriptive statistics for general background variables, reading measures, and rated abilities in English and a best known Non-English language.

		N	%	
Sex Breakdown				
	Males	110	46.41	
	Females	127	53.59	
	Total	237	100.00	
		Mean	**S.D.**	**N**
Age	(Range= 17-40)	19.09	(2.60)	235
Number of Languages Known	(Range= 1-6)	2.35	(0.91)	237
		Mean	**S.D.**	**N**
Age of Acquisition of				
	Second language	8.32	(5.39)	206
	Third language	12.79	(2.99)	91
	Fourth langauge	14.77	(3.35)	22
	Fifth language	16.00	(1.63)	7
		Mean	**S.D.**	**N**
SAT Performance				
	Verbal Score	538	(76)	191
	Total Score	1127	(108)	196
		Mean	**S.D.**	**N**
Reading Measures				
Reading Speed	Recreational	3.31	(1.02)	235
	Technical	2.92	(0.89)	235
Reading Comprehension	Recreational	3.62	(0.84)	235
	Technical	3.26	(0.88)	234
		Mean	**S.D.**	**N**
English Abilities				
	Speaking	4.37	(0.76)	226
	Reading	4.35	(0.82)	226
	Writing	4.14	(0.88)	226
	Listening	4.42	(0.74)	226
		Mean	**S.D.**	**N**
Non-English Abilities				
	Speaking	3.01	(1.28)	207
	Reading	2.84	(1.32)	206
	Writing	2.52	(1.28)	206
	Listening	3.33	(1.38)	206
		N	**%**	**(Total N)**
Ranking of English as a a Best Known Language	Ranked First	204	86.81	(235)
	Ranked Second	28	13.40	(209)

Notes:

1. Reading measures were rated by subjects on a five point scale where 1 meant slower/less than N.Y.U. peers, 3 meant equal to N.Y.U. peers, and 5 meant faster/more than N.Y.U. peers.

2. English and Non-English language abilities were rated on a five point scale where 1 mean minimal ability, 3 meant average ability, and 5 meant advanced ability.

Table 2. Frequencies and percentages with which a language was acquired as a first to fifth language.

	Order of Language Acquisition									
	First		Second		Third		Fourth		Fifth	
Language	f	%	f	%	f	%	f	%	f	%
English	150	63.83	70	33.33	11	11.70	4	17.39	0	0.0
Chinese	23	9.79	4	1.90	2	2.13	2	8.70	0	0.0
Spanish	16	6.81	50	23.81	36	38.30	5	21.74	0	0.0
Korean	8	3.40	1	.48	0	0.0	0	0.0	0	0.0
Russian	6	2.55	1	.48	0	0.0	0	0.0	1	14.29
French	4	1.70	20	9.52	26	27.66	7	30.43	4	57.14
Greek	4	1.70	4	1.90	0	0.0	0	0.0	0	0.0
Gujrati	4	1.70	1	.48	0	0.0	0	0.0	0	0.0
Italian	3	1.28	11	5.24	5	5.32	1	4.35	0	0.0
Hebrew	2	.85	15	7.14	2	2.13	0	0.0	0	0.0
Polish	2	.85	0	0.0	0	0.0	0	0.0	0	0.0
Serbo-Croatian	2	.85	0	0.0	0	0.0	0	0.0	0	0.0
Urdu	2	.85	1	.48	0	0.0	0	0.0	0	0.0
Arabic	1	.42	0	0.0	1	1.06	1	4.35	0	0.0
Creole	1	.42	0	0.0	0	0.0	0	0.0	0	0.0
Guyanese	1	.42	0	0.0	0	0.0	0	0.0	0	0.0
Indian	1	.42	0	0.0	0	0.0	0	0.0	0	0.0
Japanese	1	.42	3	1.43	2	2.13	0	0.0	0	0.0
Persian	1	.42	2	.95	0	0.0	0	0.0	0	0.0
Roumanian	1	.42	0	0.0	0	0.0	0	0.0	0	0.0
Ukrainian	1	.42	2	.95	0	0.0	0	0.0	0	0.0
Wen-Chew	1	.42	0	0.0	0	0.0	0	0.0	0	0.0
Dutch	0	0.0	0	0.0	1	1.06	0	0.0	0	0.0
Filipino	0	0.0	1	.48	1	1.06	0	0.0	0	0.0
German	0	0.0	8	3.81	1	1.06	1	4.35	1	14.29
Hindi	0	0.0	4	1.90	0	0.0	0	0.0	0	0.0
Hungarian	0	0.0	0	0.0	1	1.06	0	0.0	0	0.0
Indonesian	0	0.0	1	.48	0	0.0	0	0.0	0	0.0
Jamaican	0	0.0	0	0.0	1	1.06	0	0.0	0	0.0
Kiswahili	0	0.0	0	0.0	1	1.06	0	0.0	0	0.0
Latin	0	0.0	3	1.43	2	2.13	1	4.35	1	14.29
Marathi	0	0.0	0	0.0	0	0.0	1	4.35	0	0.0
Norwegian	0	0.0	1	.48	0	0.0	0	0.0	0	0.0
Portugese	0	0.0	3	1.43	0	0.0	0	0.0	0	0.0
Tagalog	0	0.0	1	.48	0	0.0	0	0.0	0	0.0
Taiwanese	0	0.0	1	.48	0	0.0	0	0.0	0	0.0
Vietnamese	0	0.0	1	.48	0	0.0	0	0.0	0	0.0
Yiddish	0	0.0	0	0.0	1	1.06	0	0.0	0	0.0
Yugoslavian	0	0.0	1	.48	0	0.0	0	0.0	0	0.0
Totals	235	100.00	210	100.00	94	100.00	23	100.00	7	100.00

Table 3. Frequencies and percentages for contexts of acquisition in which a language was acquired as a first to fifth language.

Context of Acquisition	Order of Language Acquisition									
	First		Second		Third		Fourth		Fifth	
	f	%	f	%	f	%	f	%	f	%
Home	219	93.99	35	16.83	5	5.38	0	0.0	0	0.0
School	0	0.0	147	70.67	80	86.02	21	95.45	7	100.00
Home & School	14	6.01	19	9.13	3	3.23	1	4.54	0	0.0
Work	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Home & Work	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
School & Work	0	0.0	0	0.0	1	1.07	0	0.0	0	0.0
Home, School & Work	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Community	0	0.0	3	1.44	2	2.15	0	0.0	0	0.0
Television	0	0.0	1	.48	0	0.0	0	0.0	0	0.0
In Country	0	0.0	3	1.44	2	2.15	0	0.0	0	0.0
Totals	233	100.00	208	100.00	93	100.00	22	100.00	7	100.00

Table 4. Frequency and percentage distribution for subjects divided into bilingualism groupings.

Bilingualism Groupings	N	%
I. English monolinguals	24	10.13
II. English acquired first, Other language before 6	38	16.03
III. English first, Other language between 6 & 12	28	11.81
IV. English first, Other language after 12	57	24.05
V. Other language acquired first, English before 6	40	16.88
VI. Other language first, English between 6 & 12	22	9.28
VII. Other language first, English after 12	6	2.53
VIII. Other two languages first, English third	15	6.33
IX. Bilinguals, indeterminate background	5	2.11
X. Indeterminate language background	2	0.84
Total	237	100.00

Table 5. Descriptive statistics and ANOVA results for SAT scores and rated reading patterns for groups based on bilingual background. Means, standard deviations (in parentheses), and sample sizes are provided.

		Bilingual Groups								
English Language Abilities	English Monolingual	Bilinguals-English Acquired First Other Language Acquired Before 6	Between 6 & 12	After 12	Bilingual-Other L Acquired first English Acquired Before 6	Between 6 & 12	After 12	English Acquired Third	F value	p value
SAT Verbal	575 (72.04) N= 20	543 (56.51) N= 31	566 (64.07) N= 23	559 (64.42) N= 53	533 (64.98) N= 31	472 (79.05) N= 15	450 (105.36) N= 3	439 (85.04) N= 10	8.18	p< .001
SAT Total	1157 (123) N= 20	1130 (101) N= 31	1149 (98) N= 24	1144 (114) N= 54	1115 (87) N= 33	1057 (113) N= 16	1110 (17) N= 3	1070 (111) N= 10	2.13	p< .05
Recreational Reading Speed	3.46 (0.98) N= 24	3.40 (0.79) N= 38	3.67 (0.83) N= 27	3.42 (1.12) N= 57	3.42 (0.98) N= 40	2.86 (1.01) N= 21	2.50 (0.84) N= 6	2.53 (1.12) N= 15	3.36	p< .01
Technical Reading Speed	3.08 (0.93) N= 24	3.00 (0.84) N= 38	3.04 (0.71) N= 27	3.14 (0.93) N= 57	2.82 (0.87) N= 40	2.67 (0.91) N= 21	1.67 (0.82) N= 6	2.73 (0.61) N= 15	3.03	p< .01
Recreational Reading Comprehension	3.87 (0.74) N= 24	3.58 (0.79) N= 38	3.67 (0.73) N= 27	3.82 (0.87) N= 57	3.75 (0.84) N= 40	3.29 (0.64) N= 21	2.50 (0.84) N= 6	3.20 (0.82) N= 15	3.87	p< .001
Technical Reading Comprehension	3.33 (1.01) N= 24	3.32 (0.81) N= 38	3.18 (0.74) N= 27	3.46 (0.89) N= 57	3.30 (0.88) N= 40	3.15 (0.67) N= 20	2.00 (0.89) N= 6	3.33 (0.93) N= 15	2.41	p< .05
Hours/Week Recreational Reading	6.87 (4.75) N= 23	3.61 (2.32) N= 36	5.46 (4.33) N= 28	5.75 (4.28) N= 56	5.53 (3.78) N= 38	4.15 (4.29) N= 20	7.00 (3.74) N= 5	5.27 (4.62) N= 15	1.91	p< .10
Hours/Week Technical Reading	11.26 (7.12) N= 23	8.44 (8.37) N= 36	11.85 (8.89) N= 27	10.89 (6.93) N= 56	10.03 (6.00) N= 38	8.25 (5.27) N= 20	11.20 (7.89) N= 5	10.67 (7.71) N= 15	0.87	p> .10

Note: Reading speed and comprehension were rated on a 5 point rating scale where one meant slower/less than N.Y.U. peers, 3 meant equal to N.Y.U. peers, and 5 meant faster/more than N.Y.U peers.

Table 6. Bonferroni t-test results for SAT scores and ratings of reading patterns for groups divided on bilingual background.

			Bilingual Groups						
			Bilinguals-English Acquired First Other Language Acquired			Bilingual-Other L Acquired first English Acquired			English Acquired
English Language Abilities	Row Grouping	English Monolingual (Group 1)	Before 6 (Group 2)	Between 6 & 12 (Group 3)	After 12 (Group 4)	Before 6 (Group 5)	Between 6 & 12 (Group 6)	After 12 (Group 7)	Third (Group 8)
SAT Verbal	Group 6	***	**	***	***	+			
	Group 7	*	+	+	+	+			
	Group 8	***	***	***	***	***			
SAT Total	Group 6	+	+	+	+				
	Group 8	+			+				
Recreational Reading Speed	Group 6	+	+	+	+	+			
	Group 7	+	+	+	+	+			
	Group 8	+	+	*	+	+			
Technical Reading Speed	Group 7	*	*	*	**	+	+		+
Recreational Reading Comprehension	Group 6	+			+	+			
	Group 7	**	+	*	**	**	+		
	Group 8	+			+	+			
Technical Reading Comprehension	Group 7	*	*	+	**	**	+		*
Hours/Week Recreational Reading	Group 4		+						
	Group 5		+						
	Group 6	+							

Notes: The Bonferroni correction is made to keep the overall Type I error down to a reasonable level for the 28 pairwise comparisions between means that were made for each significant ANOVA. Because of the preliminary nature of this study trend-like differences are indicated by the plus sign ("+"). A difference was considered trend-like if it were significant at a per comparision alpha of .05 (i.e., the t-test had a conventionally significant difference). The following table provides information on symbols used above, the overall alpha level, and the per comparision alpha.

Symbols	Overall α	Per Comparision α
(blank)	na	p> .05
+	.3366	p< .05
*	.05	.0018
**	.01	.00036
***	.001	.000036

Table 7. Differences for rated English abilities among groups divided on the basis of bilingualism grouping. Means, standard deviations (in parentheses), and sample sizes are provided.

English Language Abilities	Bilingualism Groupings: English Monolingual	Bilinguals-English Acquired First, Other Language Acquired: Before 6	Between 6 & 12	After 12	Bilingual-Other L Acquired first, English Acquired: Before 6	Between 6 & 12	After 12	English Acquired Third	F value	p value
Speaking	4.37 (0.76) N= 19	4.57 (0.60) N= 37	4.59 (0.57) N= 27	4.58 (0.53) N= 57	4.36 (0.71) N= 39	4.09 (0.87) N= 22	2.50 (0.84) N= 6	4.00 (0.91) N= 13	9.36[1]	p< .0001
Reading	4.53 (0.70) N= 19	4.51 (0.77) N= 37	4.52 (0.70) N= 27	4.60 (0.59) N= 57	4.31 (0.73) N= 39	3.91 (1.06) N= 22	3.00 (1.09) N= 6	3.92 (0.86) N= 13	5.84	p< .0001
Writing	4.21 (0.85) N= 19	4.40 (0.80) N= 37	4.30 (0.72) N= 27	4.42 (0.65) N= 57	4.13 (0.83) N= 39	3.54 (0.86) N= 22	2.67 (1.03) N= 6	3.61 (1.04) N= 13	7.29	p< .0001
Listening	4.32 (0.82) N= 19	4.62 (0.59) N= 37	4.44 (0.93) N= 27	4.58 (0.56) N= 57	4.44 (0.68) N= 39	4.23 (0.68) N= 22	3.50 (1.05) N= 6	4.08 (0.95) N= 13	2.94[1]	p< .01

Notes:
1. Variances among groups are significantly different. However, ordinary F values are reported because Welch F and Brown-Fosythe F values generally agreed with the obtained ordinary F.

Table 8. Bonferroni t-test results for ratings of English language abilities divided on bilingualism grouping.

			Bilingualism Groupings						
			Bilinguals-English Acquired First Other Language Acquired			Bilingual-Other L Acquired first English Acquired			English Acquired
English Language Abilities	Row Grouping	English Monolingual (Group 1)	Before 6 (Group 2)	Between 6 & 12 (Group 3)	After 12 (Group 4)	Before 6 (Group 5)	Between 6 & 12 (Group 6)	After 12 (Group 7)	Third (Group 8)
Speaking[1]	Group 6		+	+	+				
	Group 7	*	*	*	*	+	+		+
	Group 8		+	+	+				
Reading	Group 6	+	+	+	*	+			
	Group 7	***	***	***	***	**	+		+
	Group 8	+	+	+	+				
Writing	Group 6	+	**	*	***	+			
	Group 7	**	***	***	***	**	+		+
	Group 8	+	+	+	*	+			
Listening	Group 6		+		+				
	Group 7		+		+				

Notes:

1. Separate variance or Welch t-tests used because of unequal variances among groups.

2. The Bonferroni correction is made to keep the overall Type I error down to a reasonable level for the 28 pairwise comparisions between means that were made for each significant ANOVA. Because of the preliminary nature of this study trend-like differences are indicated by the plus sign ("+"). A difference was considered trend-like if it were significant at a per comparision alpha of .05 (i.e., the t-test had a conventionally significant difference). The following table provides information on symbols used above, the overall alpha level, and the per comparision alpha.

Symbols	Overall α	Per Comparision α
(blank)	na	p> .05
+	.3366	p< .05
*	.05	.0018
**	.01	.00036
***	.001	.000036

Table 9. Differences for Non-English or other language abilities among groups divided on the basis of bilingualism background. Means, standard deviations (in parentheses), and sample sizes are provided.

		Bilingualism Groupings								
Other Language Abilities	English Monolingual	Bilinguals-English Acquired First Other Language Acquired Before 6	Between 6 & 12	After 12	Bilingual-Other L Acquired first English Acquired Before 6	Between 6 & 12	After 12	English Acquired Third	F value	p value
Speaking	na	3.27	2.36	2.16	3.18	4.14	4.50	4.31	18.52	p< .0001
	na	(1.02)	(0.95)	(1.07)	(1.12)	(1.08)	(0.84)	(0.75)		
	na	N= 37	N= 28	N= 56	N= 39	N= 22	N= 6	N= 13		
Reading	na	3.06	2.86	2.59	2.18	3.59	4.33	3.38	5.59[1]	p< .0001
	na	(1.09)	(1.27)	(1.12)	(1.25)	(1.68)	(0.82)	(1.32)		
	na	N= 36	N= 28	N= 56	N= 39	N= 22	N= 6	N= 13		
Writing	na	2.78	2.32	2.41	1.92	3.09	4.17	3.00	5.16[1]	p< .0001
	na	(0.99)	(1.16)	(1.14)	(1.24)	(1.63)	(0.41)	(1.29)		
	na	N= 36	N= 28	N= 56	N= 39	N= 22	N= 6	N= 13		
Listening	na	3.56	2.82	2.37	3.67	4.32	5.00	4.54	15.13[1]	p< .0001
	na	(1.13)	(1.39)	(1.27)	(1.15)	(0.94)	(0.00)	(0.52)		
	na	N= 36	N= 28	N= 56	N= 39	N= 22	N= 6	N= 13		

Notes:

1. Variances among groups are significantly different. However, ordinary F values are reported because Welch F and Brown-Fosythe F values generally agreed with the obtained ordinary F.

2. na = not applicable

Table 10. Bonferroni t-test results for ratings of Non-English language abilities divided on bilingualism grouping.

Other Language Abilities	Row Grouping	English Monolingual (Group 1)	Bilingualism Groupings: Bilinguals-English Acquired First, Other Language Acquired: Before 6 (Group 2)	Between 6 & 12 (Group 3)	After 12 (Group 4)	Bilingual-Other L Acquired first, English Acquired: Before 6 (Group 5)	Between 6 & 12 (Group 6)	After 12 (Group 7)	English Acquired Third (Group 8)
Speaking	Group 3	na	*						
	Group 4	na	***						
	Group 5	na		*	***				
	Group 6	na	*	***	***	**			
	Group 7	na	+	***	***	+			
	Group 8	na	*	***	***	**			
Reading[1]	Group 4	na	+						
	Group 5	na	*						
	Group 6	na			+	*			
	Group 7	na	+	+	*	***			
	Group 8	na				+			
Writing[1]	Group 5	na	*		+	+			
	Group 6	na				***			
	Group 7	na	***	***	***	***	+		+
Listening[1]	Group 3	na	+						
	Group 4	na	***						
	Group 5	na		+	***				
	Group 6	na		***	***	+			
	Group 7	na	***	***	***	***	+		+
	Group 8	na	**	***	***	*			

Notes:

1. Separate variance or Welch t-tests used because of unequal variances among groups.

2. The Bonferroni correction is made to keep the overall Type I error down to a reasonable level for the 28 pairwise comparisions between means that were made for each significant ANOVA. Because of the preliminary nature of this study trend-like differences are indicated by the plus sign ("+"). A difference was considered trend-like if it were significant at a per comparision alpha of .05 (i.e., the t-test had a conventionally significant difference). The following table provides information on symbols used above, the overall alpha level, and the per comparision alpha.

Symbols	Overall α	Per Comparision α
(blank)	na	p> .05
+	.3366	p< .05
*	.05	.0018
**	.01	.00036
***	.001	.000036

Table 11. Correlations between age of English acquisition and SAT scores and reading measures.

	Age of English Acquisition
SAT Verbal	r= -.596 p< .001 N= 58
SAT Total	r= -.277 p< .05 N= 61
Recreational Reading Speed	r= -.321 p< .01 N= 81
Technical Reading Speed	r= -.253 p< .05 N= 81
Recreational Reading Comprehension	r= -.298 p< .01 N= 81
Technical Reading Comprehension	r= -.287 p< .02 N= 80
Recreational Reading Hours/Week	r= .021 p> .10 N= 77
Technical Reading Hours/Week	r= .057 p> .10 N= 77

Table 12. Correlations between age of English acquisition and rated abilities to speak, read, write, and listen in English and in another language (only bilinguals who acquired English as a second language are used).

English Language Abilities	Age of English Acquisition	Other Language Abilities	Age of English Acquisition
Speaking	r= -.392 p< .001 N= 80	**Speaking**	r= .452 p< .001 N=79
Reading	r= -.361 p< .05 N= 79	**Reading**	r= .511 p< .001 N= 79
Writing	r= -.471 p< .001 N= 79	**Writing**	r= .495 p< .001 N= 79
Listening	r= -.328 p< .01 N= 79	**Listening**	r= .419 p< .001 N= 79

Table 13. Two-way frequency table for breakdown of bilingual groups with age of English acquisition grouping.

Age of English Acquisition Grouping

Bilingualism Grouping	English Monolinguals	**Before** Age 6	English Acquired Between Ages 6 & 12	After Age 12	Row Totals
Monolinguals	24	0	0	0	24
English First- Other L before 6	0	38	0	0	38
English First- Other L between 6 & 12	0	28	0	0	28
English First- Other L affter 12	0	57	0	0	57
Other L First- English before 6	0	40	0	0	40
Other L First- English between 6 & 12	0	0	22	0	22
Other L First- English after 12	0	0	0	6	6
English Third	0	2	6	6	14
Column Totals	24	165	28	12	229

Table 14. Differences for SAT scores and reading measures among groups divided on the basis of age of acquisition of English. Means, standard deviations (in parentheses), and sample sizes are provided.

Age of English Acquisition Grouping

Measures	English Monolinguals	English Acquired Before Age 6	English Acquired Between Ages 6 & 12	English Acquired After Age 12	F value	p value
SAT Verbal	575 (72.04) N= 20	550 (62.99) N= 140	460 (80.30) N= 18	429 (97.20) N= 7	17.81	p< .0001
SAT Total	1157 (132) N= 20	1136 (102) N= 144	1054 (106) N= 19	1094 (119) N= 7	4.16	p< .01
Recreational Reading Speed	3.46 (0.98) N= 24	3.46 (0.97) N= 164	2.78 (0.97) N= 27	2.33 (0.98) N= 12	8.30	p< .0001
Technical Reading Speed	3.08 (0.93) N= 24	3.01 (0.86) N= 164	2.74 (0.86) N= 27	2.08 (0.79) N= 12	5.03	p< .01
Recreational Reading Comprehension	3.87 (0.74) N= 24	3.72 (0.82) N= 164	3.22 (0.64) N= 27	2.92 (1.00) N= 12	6.92	p< .001
Technical Reading Comprehension	3.33 (1.01) N= 24	3.34 (0.84) N= 164	3.31 (0.74) N= 26	2.50 (1.00) N= 12	3.63	p< .02
Recreational Reading Hours/Week	6.87 (4.75) N= 23	5.19 (3.93) N= 160	3.77 (3.86) N= 26	6.64 (3.75) N= 11	2.88	p< .05
Technical Reading Hours/Week	11.26 (7.12) N= 23	10.27 (7.45) N= 159	7.42 (5.30) N= 26	13.82 (7.15) N= 11	2.40	p= .07

Note: Reading speed/comprehension measures were rated by respondents on a five point scale where 1 meant slower/less than peers, 3 meant equal to peers, and 5 meant faster/greater than peers.

Table 15. Results of Bonferroni t-tests among groups based on age of acquisition of English.

Age of English Acquisition Grouping

Measures	Row Groups	English Monolinguals (Group 1)	Before Age 6 (Group 2)	English Acquired Between Ages 6 & 12 (Group 3)	After Age 12 (Group 4)
SAT Verbal					
	Group 3	***	***		
	Group 4	***	***		
SAT Total					
	Group 3	*	**		
Recreational Reading Speed	Group 3	+	**		
	Group 4	**	***		
Technical Reading Speed	Group 4	**	**	+	
Recreational Reading Comprehension	Group 3	*	*		
	Group 4	**	**		
Technical Reading Comprehension	Group 4	*	**	*	
Recreational Reading Hours/Week	Group 3	**		+	
Technical Reading Hours/Week	Group 4			+	

Notes: The Bonferroni correction is made to keep the overall Type I error down to a reasonable level for the 6 pairwise comparisions between means that were made for each significant ANOVA. Because of the preliminary nature of this study trend-like differences are indicated by the plus sign ("+"). A difference was considered trend-like if it were significant at a per comparision alpha of .05 (i.e., the t-test had a conventionally significant difference). The following table provides information on symbols used above, the overall alpha level, and the per comparision alpha.

Symbols	Overall α	Per Comparision α
(blank)	na	p> .05
+	.2649	p< .05
*	.05	.0083
**	.01	.00167
***	.001	.000167

Table 16. Differences for rated English language abilities among groups divided on the basis of age of acquisition of English. Means, standard deviations (in parentheses), and sample sizes are provided.

	Age of English Acquisition Grouping					
English Langauge Abilities	English Monolinguals	English Acquired Before Age 6	English Acquired Between Ages 6 & 12	English Acquired After Age 12	F value	p value
Speaking	4.37 (0.76) N= 19	4.53 (0.60) N= 162	4.04 (0.85) N= 27	3.00 (1.00) N= 11	20.40[1]	p< .0001
Reading	4.53 (0.70) N= 19	4.50 (0.69) N= 162	3.93 (1.00) N= 27	3.18 (0.98) N= 11	14.28	p< .0001
Writing	4.21 (0.85) N= 19	4.33 (0.75) N= 162	3.63 (0.84) N= 27	2.64 (0.81) N= 11	21.29	p< .0001
Listening	4.32 (0.82) N= 19	4.54 (0.67) N= 162	4.22 (0.70) N= 27	3.45 (0.93) N= 11	9.30	p< .0001

Notes:
1. Variances among groups are significantly different. However, ordinary F values are reported because Welch F and Brown-Forsythe F values generally agreed with the obtained ordinary F.

Table 17. Bonferroni t-test differences for rated English language abilities among groups divided on the basis of age of acquisition of English. Asterisks indicate significance levels.

Age of English Acquisition Grouping

English Language Abilities	Row Groupings	English Monolinguals (Group 1)	Before Age 6 (Group 2)	English Acquired Between Ages 6 & 12 (Group 3)	After Age 12 (Group 4)
Speaking	Group 3		*		
	Group 4	**	**	*	
Reading	Group 3	*	**		
	Group 4	***	***	*	
Writing	Group 3	+	***		
	Group 4	***	***	**	
Listening	Group 4	***	***	**	

Notes: The Bonferroni correction is made to keep the overall Type I error down to a reasonable level for the 6 pairwise comparisions between means that were made for each significant ANOVA. Because of the preliminary nature of this study trend-like differences are indicated by the plus sign ("+"). A difference was considered trend-like if it were significant at a per comparision alpha of .05 (i.e., the t-test had a conventionally significant difference). The following table provides information on symbols used above, the overall alpha level, and the per comparision alpha.

Symbols	Overall α	Per Comparision α
(blank)	na	p> .05
+	.2649	p< .05
*	.05	.0083
**	.01	.00167
***	.001	.000167

Table 18. Differences for rated Non-English language abilities among groups divided on the basis of age of acquisition of English. Means, standard deviations (in parentheses), and sample sizes are provided.

	Age of English Acquisition Grouping					
Other Langauge Abilities	English Monolinguals	English Acquired Before Age 6	English Acquired Between Ages 6 & 12	English Acquired After Age 12	F value	p value
Speaking	na	2.72	4.15	4.36	26.53	p< .0001
	na	(1.17)	(1.03)	(0.81)		
	na	N= 162	N= 27	N= 11		
Reading	na	2.63	3.56	4.18	12.81	p< .0001
	na	(1.21)	(1.62)	(0.87)		
	na	N= 161	N= 27	N= 11		
Writing	na	2.35	3.00	4.00	11.86[1]	p< .0001
	na	(1.16)	(1.54)	(0.89)		
	na	N= 161	N= 27	N= 11		
Listening	na	3.06	4.33	4.73	18.58[1]	p< .0001
	na	(1.36)	(0.88)	(0.47)		
	na	N= 161	N= 27	N= 11		

Notes:
1. Variances among groups are significantly different. However, ordinary F values are reported because Welch F and Brown-Forsythe F values generally agreed with the obtained ordinary F.

Table 19. Bonferroni t-test differences for rated Non-English language abilities among groups divided on the basis of age of acquisition of English. Asterisks indicate significance levels.

Age of English Acquisition Grouping

Other Language Abilities	Row Groupings	English Monolinguals (Group 1)	Before Age 6 (Group 2)	English Acquired Between Ages 6 & 12 (Group 3)	After Age 12 (Group 4)
Speaking	Group 3	na	***		
	Group 4	na	***		
Reading	Group 3	na	**		
	Group 4	na	***		
Writing	Group 3	na	+		
	Group 4	na	***	+	
Listening	Group 3	na	***		
	Group 4	na	***		

Notes: The Bonferroni correction is made to keep the overall Type I error down to a reasonable level for the 6 pairwise comparisions between means that were made for each significant ANOVA. Because of the preliminary nature of this study trend-like differences are indicated by the plus sign ("+"). A difference was considered trend-like if it were significant at a per comparision alpha of .05 (i.e., the t-test had a conventionally significant difference). The following table provides information on symbols used above, the overall alpha level, and the per comparision alpha.

Symbols	Overall α	Per Comparision α
(blank)	na	p> .05
+	.2649	p< .05
*	.05	.0083
**	.01	.00167
***	.001	.000167

Table 20. Frequencies and percentages with which a language was ranked as being best known or second best known.

Rank Order of Best Known Languages

	Ranked First		Ranked Second	
Language	**f**	**%**	**f**	**%**
English	204	86.81	28	13.40
Chinese	4	1.70	19	9.09
Spanish	4	1.70	72	34.45
French	3	1.28	27	12.92
Hebrew	3	1.28	9	4.31
Russian	3	1.28	3	1.43
Italian	2	0.85	11	5.26
Urdu	2	0.85	1	0.48
Japanese	2	0.85	0	0.00
Korean	1	0.42	8	3.83
Greek	1	0.42	6	2.87
Gujrati	1	0.42	3	1.43
Portugese	1	0.42	2	0.96
Serbo-Croatian	1	0.42	1	0.48
Polish	1	0.42	0	0.00
Norwegian	1	0.42	0	0.00
Dutch	1	0.42	0	0.00
German	0	0.0	7	3.35
Ukrainian	0	0.00	3	1.43
Arabic	0	0.00	1	0.48
Roumanian	0	0.00	1	0.48
Indian	0	0.00	1	0.48
Latin	0	0.00	1	0.48
Indonesian	0	0.00	1	0.48
Jamaican	0	0.00	1	0.48
Persian	0	0.00	1	0.48
Yugoslavian	0	0.00	1	0.48
Totals	235	100.00	209	100.00

Table 21. Two-way frequency table of the breakdown of bilingual groups with ranking of English groups.

Ranking of English as Best Known Language

Bilingualism Grouping	English Ranked First	English Ranked Second	English Not Ranked	Row Totals
Monolinguals	24	0	0	24
English First-Other L before 6	36	1	0	37
English First-Other L between 6 & 12	27	1	0	28
English First-Other L after 12	57	0	0	57
Other L First-English before 6	36	3	0	39
Other L First-English between 6 & 12	13	9	0	22
Other L First-English after 12	1	5	0	6
English Third	5	8	2	15
Column Totals	199	27	2	228

Table 22. Frequency table for breakdown of age of English acquisition grouping with ranking of English grouping.

Ranking of English as Best Known Language

Age of English Acquisition Grouping	English Ranked First	English Ranked Second	English Not Ranked	Row Totals
English Monolinguals	24	0	0	24
English Acquired Before Age 6	158	5	0	163
English Acquired Between Ages 6 & 12	15	12	1	28
English Acquired After Age 12	1	10	1	12
Column Totals	198	27	2	227

Table 23. Differences on SAT scores and reading measures between respondents who ranked English as their best known language and who ranked English as their second best known language. Means, standard deviations (in parenthesis) and sample sizes are provided along with t-test and p values for the difference between means.

English Ranking Groups

Measures	English Ranked Best Known	Second Best	t-value(df)	p
SAT Verbal	550 (64.49) N= 170	420 (85.62) N= 15	7.27(183)	p< .0001
SAT Total	1135 (104) N= 175	1042 (113) N= 15	3.31(188)	p< .01
Recreational Reading Speed	3.43 (0.97) N= 198	2.55 (1.05) N= 27	4.34(223)	p< .0001
Technical Reading Speed	3.00 (0.83) N= 198	2.37 (1.11) N= 27	2.85(30.0)[1]	p< .01
Recreational Reading Comprehension	3.72 (0.79) N= 198	3.15 (0.91) N= 27	3.46(223)	p< .001
Technical Reading Comprehension	3.32 (0.85) N= 197	3.00 (1.04) N= 27	1.79(222)	p< .08
Recreational Reading Hours/Week	5.24 (3.91) N= 193	6.04 (5.25) N= 25	-0.92(216)	p> .10
Technical Reading Hours/Week	10.11 (7.04) N= 192	12.00 (8.87) N= 25	-1.22(215)	p> .10

Notes:

1. Separate variance or Welch t-test used because of unequal variances.

2. To maintain an overall Type I error rate equal to .05 the above p values should be less than or equal to .00625.

Table 24. Differences on rated English abilities between respondents who ranked English as their best known language and who ranked English as their second best known language. Means, standard deviations (in parenthesis) and sample sizes are provided along with t-test and p values for the difference between means.

English Ranking Groups

Measures	English Ranked Best Known	Second Best	t-value(df)	p
English Speaking Ability	4.51 (0.62) N= 195	3.42 (0.99) N= 26	5.46(27.7)[1]	p< .0001
English Reading Ability	4.45 (0.75) N= 195	3.73 (1.00) N= 26	3.51(28.8)[1]	p< .01
English Writing Ability	4.29 (0.79) N= 195	3.15 (0.83) N= 26	6.86(219)	p< .0001
English Listening Ability	4.51 (0.83) N= 198	3.81 (1.11) N= 27	4.79(219)	p< .0001

Notes:

1. Separate variance or Welch t-test used because of unequal variances.

2. To maintain an overall Type I error rate equal to .05 the above p values should be less than or equal to .0125.

Table 25. Differences on rated other, non-English language abilities between respondents who ranked English as their best known language and who ranked English as their second best known language. Means, standard deviations (in parenthesis) and sample sizes are provided along with t-test and p values for the difference between means.

English Ranking Groups

Measures	English Ranked Best Known	Second Best	t-value(df)	p
Other Language Speaking	2.77 (1.17) N= 175	4.59 (0.64) N= 27	-12.05(58.0)[1]	p< .0001
Other Language Reading	2.60 (0.75) N= 195	4.37 (1.00) N= 26	-9.49(45.3)[1]	p< .0001
Other Language Writing	2.30 (1.16) N= 174	3.96 (1.02) N= 27	-7.72(37.3)[1]	p< .0001
Other Language Listening	3.14 (1.36) N= 174	4.63 (0.63) N= 27	-9.39(71.5)[1]	p< .0001

Notes:

1. Separate variance or Welch t-test used because of unequal variances.

2. To maintain an overall Type I error rate equal to .05 the above p values should be less than or equal to .0125.

Language Acquisition History and English Reading Ability Questionnaire

Part I: Language Background

1. What is your: (a) Sex: M F (b) Age:_____

2. How many languages do you know?_____

3. List the order in which you learned all of the languages you know. Specify the age at which you began to learn the language and where you learned it (i.e., home, school, church, etc.). For example, English may be your first language. You would indicate this by writing "English, Birth, Home" under the appropriate headings below.

Language	Age	Learning Situation
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

3. Give a rating of your ability to use the two languages you know best. In the space next to "1st L" write the name of the language you know best and in the space next to "2nd L" write the name of the language that you either know equally well or next best (if you know only one language leave "2nd L" blank and unrated). Circle the number on the scale next to the ability for each language.

	1st L_____					2nd L_____				
Speaking	1	2	3	4	5	1	2	3	4	5
Reading	1	2	3	4	5	1	2	3	4	5
Writing	1	2	3	4	5	1	2	3	4	5
Listening	1	2	3	4	5	1	2	3	4	5
	Minimal		Average		Advanced	Minimal		Average		Advanced

Part II: English Reading Ability

1. What are your: (a) SAT verbal score _____ (b) SAT Total score _____

2. English Reading Ability: How would you rate your reading ability relative to other NYU students for "recreational material" (e.g., novels, magazines, etc.) and "technical material" (e.g., textbooks, journal articles, etc.)

	A. RECREATIONAL READING:					B. TECHNICAL READING				
SPEED:	1	2	3	4	5	1	2	3	4	5
	Slower		Equal		Faster	Slower		Equal		Faster
COMPREHENSION:	1	2	3	4	5	1	2	3	4	5
	Poorer		Equal		Better	Poorer		Equal		Better

3. English Reading Habits: How many hours per week do you spend reading:

A) Recreational material _____ HRS. B) Technical material _____ HRS.

(Palij/Watts/Aaronson Language & Reading Questionnaire - January 1987)

Language Background Questionnaire **Fall 1988**

Part I: General Background

1. What is your: (a) Sex: M F (b) Age:_____

2. While growing up, what percentage of time did you use English in the following situations (for example, if two languages were used at home then English might have been used only 60% of the time):

a) Home_____ b) School_____ c) Community_____ d) In general_____

3. At present, what percentage of time do you use English in the following situations:

a) Home_____ b) School_____ c) Community_____ d) In general_____

4. Do you consider yourself to be bi- or multilingual: Yes No

5. If English is not your first language or if you have used some other language for some part of your life, at what age did your usage of English begin to exceed the usage of the other language (i.e., age at which you started to use English 50% or more of the time)? AGE=_____ Please indicate why shift to English was made (circle all that apply)

(a) moved to U.S.
(b) went to English-speaking school
(c) grandparents died
(d) job required English
(e) Other_____

Part II: Language Background

1. List all of the languages you know in the order you acquired them. Specify the age at which you began to learn the language and where you learned it (e.g., home, school, church, streets, playground, TV). For example, if English was your first language, you would indicate this by writing "English, Birth, Home" under the appropriate headings below.

Language	Age	Learning Situation

2. In the space below next to "Best L" write the name of the language you know best and circle the number that reflects your ability to use that language. In the space next to "2nd Best L" write the name of the language you either known equally well or second best and rate your ability to use that language (if you do not know a second language leave it blank and unrated).

	Best L_____					2nd Best L_____				
	Minimal		Average		Fluent	Minimal		Average		Fluent
Speaking	1	2	3	4	5	1	2	3	4	5
Reading	1	2	3	4	5	1	2	3	4	5
Writing	1	2	3	4	5	1	2	3	4	5
Listening	1	2	3	4	5	1	2	3	4	5
	Minimal		Average		Fluent	Minimal		Average		Fluent

Part III: English Reading Ability

1. What is your: (a) SAT verbal score_____ (b) SAT total score_____

2. (a) Did you take the TOEFL exam?: Yes No (b) If yes, what was your score:_____

3. English Reading Ability: How would you rate your reading ability relative to other NYU students for "recreational material" (e.g., novels, magazines, etc.) and "technical material" (e.g., textbooks, journal articles, etc.)

	A. Recreational Reading:					B. Technical Reading				
Speed:	1 Slower	2	3 Equal	4	5 Faster	1 Slower	2	3 Equal	4	5 Faster
Comprehension:	1 Poorer	2	3 Equal	4	5 Better	1 Poorer	2	3 Equal	4	5 Better